NGINEERING FINANCE COMMERCE

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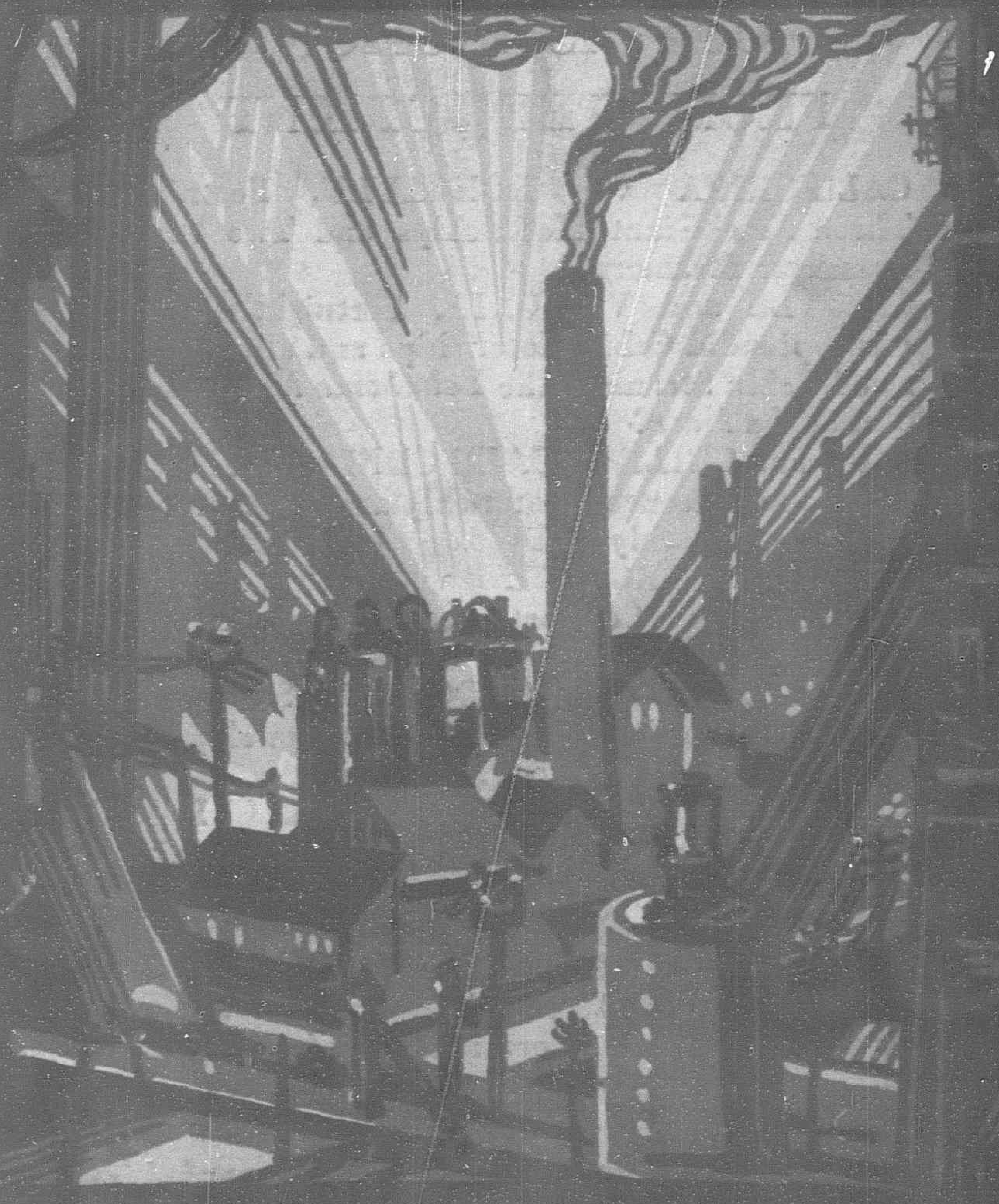
THE FAR EASTERN REVIEW

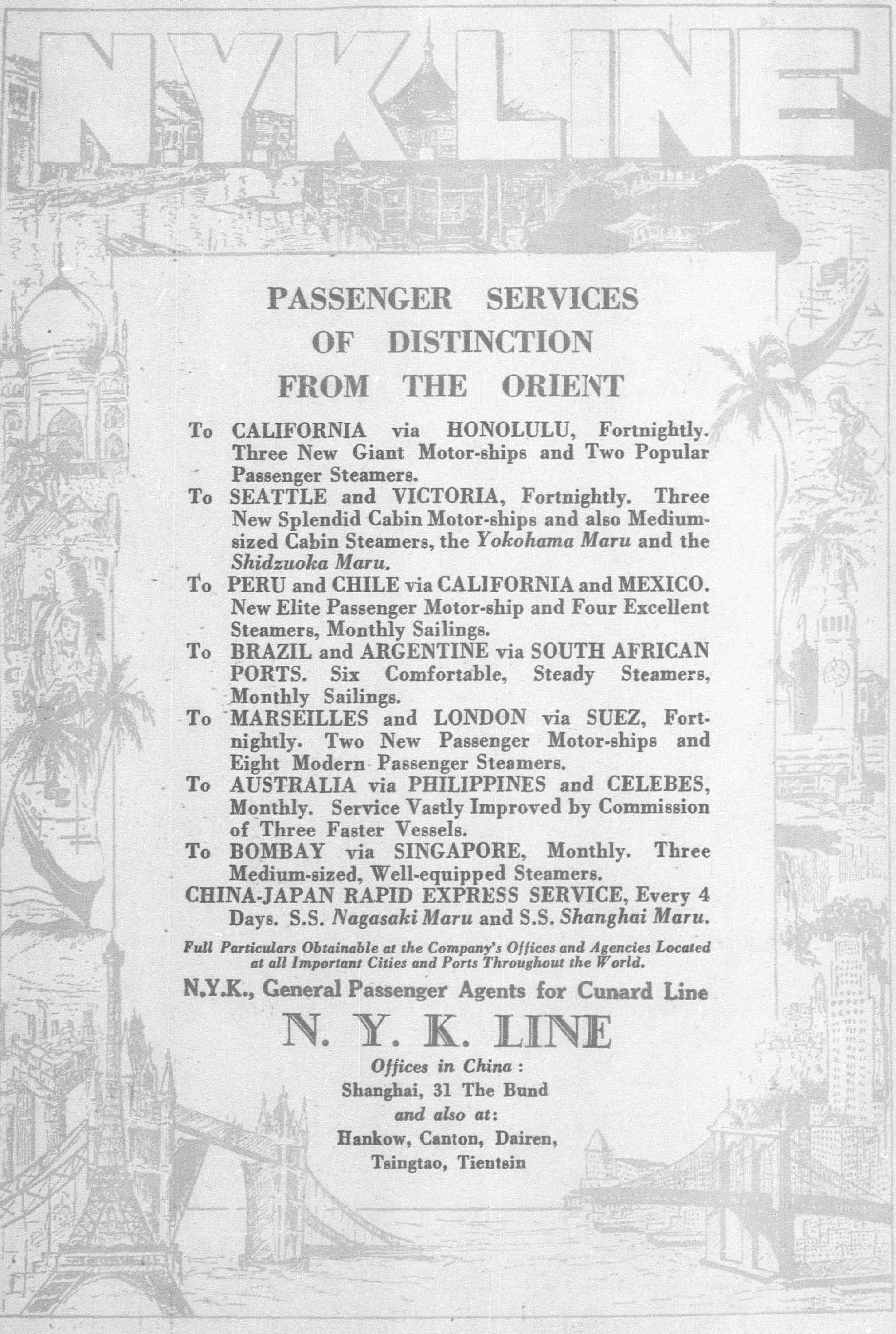


上海黃浦灘念四號

遠東時報

A DIOS!
RAILWAYS FIRST
ANALYSIS OF CHINA'S BUDGET
BEHIND THE EXTRATERRITORIALITY BARRAGE
JAPANESE LOANS TO CHINA
NEW LOCOMOTIVES FOR CHINESE RAILWAYS
BOTOCAN HYDRO-ELECTRIC PLANT
RADIO STATIONS IN SHANGHAI

Vol. XXVIII MARCH, 1931 No. 3



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The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XXVII SHANGHAI, MARCH, 1931 No. 3

A DIOS!

"THE AMERICAN PEOPLE ARE SERIOUSLY CONCERNED OVER THE LONG-CONTINUED CAPTIVITY OF MISSIONARIES NELSON AND TVEDT." The American Minister has been instructed by the State Department to make urgent representations to the National Government at Nanking, and Nanking has instructed the military authorities to obtain their release!" Three more documents added to a total of 208 letters and telegrams exchanged in a fruitless effort to obtain the release of these American citizens.

Captured by the bandits on October 5, last, the Rev. Bert Nelson and the Rev. K. N. Tvedt, have been marched from one bandit lair to another, and are now in a mountain stronghold at Yangkiashan, less than a hundred miles from the city of Hankow. Despite repeated efforts on the part of Mr. Frank P. Lockhart, American Consul General at Hankow, no serious effort has been made by the military to effect the rescue of these foreign captives.

These Americans are being held for ransom, maltreated, beaten, fed on the left-overs of the coolie gangs' rice, and exposed to the rigors of the severe Central China winter. One of these captives is the father of six fine American children, the youngest, a daughter, born since he was torn away from his family.

The boast of the Fukien bandit chief has been made good: "WE HAVE THE POWER TO TAKE YOU FOREIGNERS, TO HOLD YOU FOR RANSOM AND TO KILL YOU!" The world is witnessing the same farce which led up to the beheading of the two British missionary ladies last summer. While this tragedy was unfolding itself, the British Minister and his Government was busily engaged in surrendering the few remaining safeguards that stood between their nationals and protection. For six months, two American Missionaries have been held captive awaiting their certain martyrdom, while the State Department is engaged in conversations, discussions and negotiations for the further surrender of extraterritorial privileges!

The spell is broken. For the last four years we have listened to the platitudes of Presidents, secretaries of state, divers statesmen and spokesmen for the administration, proclaiming that "the protection of American lives and properties abroad is a fundamental obligation of government." We have seen this high sounding, mouth-filling, vote-catching phrase incorporated into the Republican National Platform, and shades of Bryan! even into the Democratic Party's pledges of national policy. We have listened to President Coolidge in a Fourth of July speech at Gettysburg solemnly proclaim and defend the doctrine while other highly placed statesmen have amplified and emphasized the determination of the Administration to live up to these pledges.

We have no more illusions. After six months of fruitless correspondence, followed by an eleventh hour face-saving protest, we are satisfied that these two American citizens will go to their martyrdom. Nothing will be done to save them. Poor misguided Americans! Poor American mother and her little children who have been waiting and praying six months for the return of their father, hoping against hope that the most powerful nation in the world—their country—would live up to its oft repeated pledges to afford them protection. It is a long, long way from Quala Batoo! Vanished are the days of the Barbary Coast, leaving only traditions which mean nothing in this pirate-infested part of the world. Gone are the days, never to return, when an American President, in just and righteous indignation thundered out the ultimatum, "PERDICARIS ALIVE OR RAISULI DEAD!" The protection of American lives and properties, the preservation of national honor, dignity and prestige, has become subordinated to the national pocket book; to the necessities of an economic situation before which nothing else matters. The two Americans, Nelson and Tvedt, will be sacrificed. A grateful Church will enshrine their names in its Book of Martyrs. They will attain sainthood and immortality, but their names will also be emblazoned on the pages of American history, as marking the pusillanimous surrender of a fundamental principle which no nation can forego and retain its self-respect.

A Dios! Nelson and Tvedt! Pray to your God! Nanking will do nothing to save you and your country has forsaken you!

G. B. R.

Railways First!

"A Beggar Sitting on a Pot of Gold"

In all discussions about the rehabilitation of China's credit through silver loans and other panaceas, the essential fact seems to be overlooked that the public credit of China cannot be restored unless the credit of the national railways is also restored. The railways of China remain the basis of national prosperity, upon whose continuous and profitable operation depends the success of any national scheme of financial rehabilitation. As long as railway loans are in default, bills for materials unpaid, and the railways are not permitted to discharge their legitimate functions, no plan for financial reconstruction can be a success. The credit of the railways is bound up in their operating income. They must earn sufficient net income for the current service of their loans and other obligations and leave a sufficient surplus for betterment of the lines. This net income cannot be earned until roadbeds have been rebuilt, bridges strengthened and rolling stock repaired or replaced. The immediate rehabilitation of the railways is therefore a fundamental requirement of the restoration of China's credit, and this foundation cannot be laid until all the government railways of the country, *including those in Manchuria*, are brought under the direct control of the Ministry of Railways.

We do not know—nor is it of interest—what are the details of the agreement entered into between Nanking and Marshal Chang Hsueh-liang as to division of territory and revenues, but we are positive that if control over the national railway system is divided between Mukden and Nanking it will be difficult to interest foreign bankers in any plan for rehabilitation or construction of new lines. There can be no division of responsibility over revenue-producing enterprises if foreign capital is to finance their reconstruction. The mere fact that certain Northern and Manchurian railways are segregated from the national system is sufficient to create distrust in the minds of investors. If there are to be two independent railway administrations in China, one at Nanking and another at Mukden, and the power of raising loans is confined to the ministry of the recognized government, it is difficult to understand how the Northeastern Railway Commission can hope to raise capital without the guarantee of the Central Government. Unless the Central Government has absolute control over the properties, its guarantee is worthless as a security for foreign bondholders. Under such conditions the credit of the railways can never be restored.

From the Chinese viewpoint it may be that the only practical solution to their political troubles is to accept the expedient of dual control imposed by the admission of Marshal Chang Hsueh-liang into the Nationalist fold, but we remain firm in our belief that any agreement which divides responsibility and control over the national railway system will not meet with the approval of foreign bankers as a suitable basis for investment of further capital in its rehabilitation or extension. Unless all these Northern and Manchurian lines are brought under one central operating control, railway expansion in this country will be limited to such financing as the Chinese themselves can undertake. If foreign financial assistance is eventually forthcoming to restore China's credit it will be based upon some plan of complete unification of the existing government lines under control of the responsible Minister of Railways and with safeguards for the expenditure of the funds and control over operative revenues. Foreign investors will never accept the guarantee of the National Government under any other conditions. There can be no responsibility without authority. Whether the Chinese will accept these conditions or not is another question, but it is highly improbable, after the experience of the past decade, that foreign capital will take any further chances in Chinese railway financing until these guarantees are forthcoming.

Any further financing from abroad must be based upon the assumption of essentially stable conditions in China as to its government and complete and effective control by the Ministry of Railways of railway finances, operation and new construction, and an absolute freedom from military interference or dual control. These basic conditions as to the railways must be created if China's credit as a whole is to be restored. Whether these conditions can ever be met depends largely upon Marshal Chang Hsueh-liang and the Manchurian leaders who are unwilling to permit Nanking to interfere in their provincial enterprises. The problem is furthermore complicated by the past commitments of the Manchurian authorities with Japan over railway rights, and which cannot be shifted to Nanking for discussion or settlement. Yet, if the fiction of a unified or federalized China is to be maintained, all Manchurian railway agreements must receive the official approval of Nanking, and we have the picture of the recognized government of the Republic of China endorsing the diplomatic agreements of a provincial administration and guaranteeing its obligations, without any supervision or authority over the properties created through its guarantee. No matter how skilfully disguised, such a system of dual responsibility will never inspire the confidence of foreign investors. All loan agreements would have to be entered into with the recognized government, which would assume full responsibility for the execution of the contract and repayment of the debt; and unless it exercises some measure of control over the properties created and the revenues derived therefrom, any contract bearing its signature is worthless. Under certain stable conditions a very good argument might be advanced for private ownership and operation of railways in China, but these conditions as yet do not exist.

Mr. W. B. Poland, the railway expert attached to the Kemmerer Mission, had these essentially stable conditions in mind when he drew up a plan for the rehabilitation of railway finances and proposed a decentralization of control by grouping the railways into several distinct systems to be government owned but independently operated corporations.

In order to secure more effective operation and management, and to facilitate future loans for betterments or new construction, Mr. Poland proposed that several of the existing railways be combined into new systems and organized under the new corporation laws of China into Government-owned but independently managed corporations, subject, however, to the general supervisory control of a Railway High Commission. The proposal contemplated an organization similar to that of the Government-owned independently-operated German railway corporation of the period of the Dawes reparation agreement with Germany.

Mr. Poland's plan is based on the assumption that a stable government exists in China, with complete unification and effective control by the Ministry of Railways of all railway finances, operation and new construction. His plans, however, are simply another contribution to the solution of a problem that remains to thwart all progress so long as the country is over-run with soldiers, bandits and communists. Not until the bandits are suppressed, communists rounded up, and two million troops disbanded, is there hope for any real progress towards the reconstruction of the country.

China is one of the richest agricultural countries in the world and can readily supply all her own food requirements and have a surplus for export; she can raise all her own cotton and tobacco; many other products derived from the soil, such as silk, wood-oil, vegetable oils, etc., will enable her to build up a highly profitable export trade in raw materials. She can create a cattle industry on the plains of Inner Mongolia and Manchuria that in a few years would place her in the front ranks of meat-producing countries, exporting beef, mutton, hides, tallow, and wool to all parts of the world.

There is room and work for all of China's millions on the land. China needs no charity from without. Her salvation can come only from within, and the essential basis for this transformation is security for lives and properties, the elimination of banditry and a militarism that preys on the labor of the masses. When such conditions are created, when law and order prevails and the farmers can cart their products to the railway, and the railway can carry them to market, a real basis will be laid for a prosperity such as China has never before experienced.

Millions poured into China for creating industries in an essentially agricultural land and population will not relieve the present depression. The Chinese economist sees only the advantage to be reaped by establishing industries in order to get rich quick by supplying a protected home market with materials now imported from abroad. He fails to see that there is a still greater profit to be made by developing the natural resources of the country with the cheapest kind of cheap agricultural labor. This labor is China's greatest and only asset in the keen struggle for existence, but it cannot be employed even to feed the nation because of the absence of law, order and protection. The recuperative power of these masses is phenomenal. In a few years of peace they would raise such crops and produce such a surplus of marketable commodities that the existing railways could not handle the traffic.

China undoubtedly is a "land of opportunity," but until the Chinese themselves take advantage of their opportunities and create a purchasing power that will absorb the manufactured products of newly-created industries, it seems unwise to advocate the industrialization of a country that cannot as yet feed itself. All the peoples of the world to-day are companions in depression. The bread-lines grow longer in America and in Europe; the hungry people waiting patiently for the wheels of industry to start revolving; waiting for China to resume her place in world economy. One of the first steps towards world-industrial relief is a return to normalcy on the part of the millions of China, at least to a degree of comparative well-being that will enable them to earn sufficient to meet their bare living expenses and leave a modest surplus with which to buy comforts. Luxuries for the people of China are still a long way off.

The Kailan Mining Administration, in a brochure on its treatment of labor, explains the problem very simply in the following words:

"Lastly, we must bear in mind that in any industry the reduction of the number of men employed on any operation is not an end in itself; it is only a means to an end—the reduction of cost. Where labor is cheap and abundant it is uneconomical to introduce many labor-saving devices which would pay where labor is more expensive. Indeed, in the present state of China, when development has been arrested by a series of civil wars, when millions are starving, when trade and commerce languish, when every movement of exchange is adverse, it may reasonably be claimed that, when there is any doubt as to whether it is more economical to introduce imported machinery or to continue to use more primitive methods employing a larger number of men, immediate humanitarian considerations will lead to preference being given to the solution which does not throw men out of work."

The whole world to-day is a vast economic network, in which no single country can exist by itself. An era of permanent economic interdependence has supplanted the old idea of nationalistic self-sufficiency. The twentieth century industrial world is a cogged machine. Prosperity cannot be enjoyed by any one country at the expense of another. Insolvency, depression, starvation, misery, chaos and anarchy in a nation of four hundred million people throws the whole machinery of world trade and credit out of gear.

It may be that new factories planted in China, because raw materials and labor are cheapest here, will bring partial relief to certain local areas, but it will dislocate the life of other communities, and China's gain will be somebody's loss. For without the domestic purchasing power to absorb these manufactured products they will have to be exported and come into competition with the toil of other more highly paid workers.

China to-day is like the picture of old Peru, "a sturdy beggar sitting on a pot of gold," with outstretched hands appealing for alms. No people can maintain their self-respect and solvency living in an international almshouse, with untold wealth under their feet waiting for someone to tickle the soil with a hoe.

If the basis of China's regeneration lies in the development of its resources by its command of cheap labor, then it follows that this labor is worthless unless the products can be hauled cheaply to the seaboard markets. Railways and more railways is the fundamental need of China, and until they can be safely operated and brought under one central administration, it is a waste of effort to discuss or advance any program for the restoration of China's credit, or the industrialization of the country.

If the railways are to operate successfully, if the people of China are to be assured of a market for the product of their toil, then the country must be pacified and the armies disbanded. No nation, no matter how powerful, how rich, or how prosperous, can support indefinitely three million armed soldiers and two million more bandits and communists eating the heart out of the country, and using the railways as revenue-producers for the upkeep of their armies.

G.B.R.

The Restoration of China's Credit

Japanese Loans to China

As the settlement of China's unsecured debts come up for adjustment, the legitimacy of the Japanese war loans, once more occupies the attention of the same anti-Japanese group which originated the campaign for their repudiation as part of the conspiracy hatched in China to incite hatred against Japan and lower her prestige in the eyes of the world, preparatory to the war with the United States which this same group so vociferously advocated and labored to bring about. Naturally, the Chinese acclaimed any plausible argument that would justify them in refusing to recognize these obligations, especially the Kuomintang leaders who claimed that the proceeds of the loans were employed by Tuan Chi-jui and the Anfu-clique to suppress their activities, and consolidate the power of the Northern militarists. Dr. Sun Yat-sen undoubtedly had a legitimate grievance in regard to the expenditure and use of these loans, and was fully justified from the viewpoint of Chinese domestic politics, in denouncing the transactions. But he also denounced the Reorganization Loan as illegal, and solemnly warned the Powers beforehand that it would never be recognized or repaid. Yet the loan was issued over his protest. The salt revenues were allocated as security for its repayment, and a special foreign staffed administration created to supervise the collection of the revenues. Another impairment of China's administrative independence resulted, the only protest coming from the President of the United States who withdrew support to the American Group and forced it to sever its connection with the old consortium because of the terms of the loan.

It is well to bear these facts in mind in any discussion over the merits of subsequent foreign loans to the Peking Government. The Reorganization Loan, after being denounced by the Kuomintang leaders as illegal is now accepted by them as a binding obligation that must be faithfully discharged.

Then came the subsequent American and Japanese unsecured war time loans to Peking. Thirteen years have passed since they were contracted. Chinese Governments have come and gone, yet to date not one cent has been repaid on the principle or the interest of these debts, nor has there been any disposition to acknowledge their validity. The interest keeps piling up. The semi-official issuing banks in Japan facing ruin, had to appeal to their Government for relief while one American corporation has gone under as a result of China's default of her unsecured obligations.

Next to the standing controversy over Japan's rights in Manchuria and the validity of the 1915 treaty, the settlement of these loans constitute the most important issue between the two countries. To all the hysterical outbursts of the Chinese press and foreign propaganda against the repayment of these loans, the Japanese have preserved a dignified silence. Only once, has any responsible Japanese official or spokesman attempted to explain the circumstances surrounding the contracting of these debts, and even then his audience was so busy discussing its own pet theories of Far Eastern problems, that it paid no attention to him. At the Conference of the Institute of Pacific Relations, held in Kyoto in November, 1929, Mr. M. Odagiri, Director of the Yokohama Specie Bank, prepared a paper explaining the Japanese Loans to China, in the expectation that it would receive serious attention and invite discussion, but after the spectacular fireworks over Manchuria had subsided, the bottom fell out of the Conference, and all other questions were side tracked. Yet, next to Mr. Y. Matsuoka's masterful presentation of Japan's position in regard to Manchuria, Mr. Odagiri's paper stands as the most important and enlightening contribution to the discussions of the Conference.

In our issue of February, 1923, we had also drawn attention to the similarity of these war-time Japanese loans to China to those made by the American Government to the Allies for the purpose of prosecuting the war against the common enemy. Japan, as one of the Allied Powers was dealing with another Ally, acknowledged and recognized by all the Powers as the *de-facto* government of China, and was attempting to bolster up this government so it could discharge the obligations it assumed when it declared war against Germany. It was impossible at that period for Japan to stipulate conditions as to supervision over the expenditure of these loans or to demand adequate security. In the first place, China had no available security. All her assets were pledged up to the hilt for the service of previous loans. Like the United States in dealing with its associates in the war, Japan could rely only on the good-faith of the nation to recognize and repay the debt, holding to that basic principle in all such transactions, that an unsecured debt, is above all, a debt of honor, which should take preference over all other obligations. In the very nature of things, any loan to China at that period had to be an unsecured loan, a debt of honor, as she had nothing to hypothecate, and there was no time to haggle over security or repayment.

That some of the funds were diverted from the common allied cause to suppress internal revolution or disorders, or were misappropriated, and that no records were kept of their disbursement, is a matter which does not affect their legitimacy. The first obligation of the nations which had a surplus of funds was to contribute generously to assist their less fortunate Allies to carry on the war.

The European financial market was closed to China. The United States, whose diplomacy forced China to break with Germany and enter the war, had an opportunity to assist her "Sister Republic" at that period. China turned first to America for financial assistance. Had the Lee, Higginson, Continental & Commercial Bank, Pacific Development and the Siems-Carey agreements been carried out in full, it would have brought over $200,000,000 of American money into China or more than the total advanced by Japan. The Lee Higginson loan, advanced without security and on the good-faith and general revenues of China, never got beyond the payment of the first million dollars ; stopped by the American Minister at Peking. The Chicago Bank and the Pacific Development loans were secured on the wine and tobacco taxes but as these revenues had been previously allocated for the security and service of a French loan, for all practical purposes, the American security was the good faith of the Chinese Government. Each of these loans was for $30,000,000 and on each the first instalment of $5,000,000 was paid. So great was the faith in China's financial honor, that when the first instalment of the Continental & Commercial Bank Loan was defaulted and had to be renewed, Mr. John Jay Abbot, vice-president of the Chicago bank, stated publicly in a press interview that China's credit was so good that no security was needed to protect the loan. "*China could have all the money it wanted without security.*" Mr. Abbot's faith in China has probably undergone considerable change since 1919, as not one cent has been paid to date on his loan, either as to interest or principle. The same treatment was accorded the Pacific Development Loan, advanced in the best of faith on China's willingness to repay. China's default on this loan, swept the Pacific Development Company into bankruptcy and liquidation, carrying with it the premier American trading concern in China, which was saved from the wreck, by a group of American machinery manufacturers who put up the new capital to carry on with.

The Siems-Carey Company, lured into China to build a group of railways which conflicted with rights previously conceded to other Powers, and to compel the American government to raise the issue of the Open Door with the Four Allies at a time they were fighting for their existence in Europe, advanced about $2,500,000 to the Peking Government and could never carry out its contract. Americans had their chance to finance China and could have monopolized all profitable undertakings had they carried out their commitments.

When a Chinese Government of the old régime needed money it got it wherever it could be found, and when all other doors were closed, it turned to Japan for help. Japan assumed the burden that America rejected, and poured out her war-profits in loans to assist China to assume her war obligations. Japan was an active belligerent. Had the war gone against the Allies she would have been ruined. She could get no supplies from Europe or America. Her tonnage was urgently required for the transport of war materials such as she could supply for the Allied armies in Europe and the Eastern fronts. China was the only country in the world that Japan could rely upon to supply her with many essential raw materials, but China had no funds with which to develop and deliver these resources. Japan did exactly what the United States and the Allied Powers did in other neutral lands or between themselves. China was an Ally. Her existence was at stake as well as those whose cause she had espoused. Japan did her best to bolster her up without asking too many questions or making impossible terms.

The nationals of the Allied Powers in China, instead of welcoming this contribution to the common cause, at a time when they were powerless to help, could see only that Japan was stealing a march on them and getting a strangle hold on China's trade and resources. As part of the general propaganda in the damnable campaign to embroil the United States and Japan in a war over China, these Japanese war loans were attacked and denounced as illegal. But if these loans are illegal, so are the American loans to China ; so is the Reorganization Loan, and every other transaction of the Peking Government that involves the credit of the Chinese nation. There is no difference between the Japanese wartime loans to China (whether they were engineered by Mr. Nishihara or the official banks), and the American loans to the Allies, or the American loans to China. Both nations, America and Japan, now stand accused of profiteering, of usury and of capturing markets that belonged to others while some of the most importunate war time borrowers are extremely loath to pay the debts they contracted.

We know nothing about the so-called Nishihara loans. Apparently no one in China knows how they were spent as the records seem to be destroyed. Only the Japanese lenders have kept the signed agreements and a record of their transaction. Their responsibility began and ended when the funds were paid over to the recognized government of the Republic of China. There is a principle involved in these unsecured loans, that cannot be easily ignored or set aside by the present government and preserve its self respect.

We are told by the press that Nanking will insist upon the cancellation of these obligations ; we are also informed that Baron Shidehara in answer to a question on the floor of the Diet, has firmly declared that the war loans cannot be cancelled. The Japanese Government, in order to relieve its banks who made these loans has assumed these obligations in order to pay the interest to the bondholders. Like the United States in dealing with a similar problem, Japan may be willing to forego or reduce the interest due, but it cannot consent to any reduction of the principal, without inviting further discussion as to their legality. As long as these loans remain unpaid or unrecognized, it will be extremely difficult for the National Government to restore its credit. The arguments advanced to discredit the Japanese loans, apply with equal if not greater force to the American loans, which Washington will continue to support as legitimate transactions. It is as impossible at this late date to go behind the Japanese war time loan agreements and question the motives of the Japanese bankers in advancing the funds, as it is to impugn the good faith of the United States in similar transactions with its war time associates. The road to the restoration of China's credit, lies through the frank recognition of the legality of these war-time loans, and leave to Japan's sense of fairness the amount of interest to be cancelled.

G. B. R.

Japanese Loans to China

By M. ODAGIRI

FOREWORD :—The following paper on Japanese Loans to China was prepared for the Kyoto Conference of the Institute of Pacific Relations by Mr. M. Odagiri, Director of the Yokohama Specie Bank, Ltd., Mr. Odagiri was formerly in the Japanese Diplomatic Service, filling the post of Consul-General at Shanghai for several years. When Japan was admitted into the first Four Power Consortium in 1910 and required the services of an expert who thoroughly understood the international political problems of China, Mr. Odagiri was invited by the Yokohama Specie Bank to accept the position of Director of the Bank and to act as the representative of the Japanese Group in these Chinese loan transactions. For the past twenty years, Mr. Odagiri has been the financial diplomat of Japan attending all the meetings and transactions of this group of international bankers. He stands to-day as one of the foremost authorities in the world on the financial problems of China. His wise counsels, based on a long and intimate experience with Chinese affairs, has been of invaluable assistance to the leaders of the other financial groups in the Consortium in shaping their program. During the war, when the other partners to the Consortium agreement, could not participate in the financing of China, the Japanese group, represented at that time by the Yokohama Specie Bank, adhered faithfully to the spirit of the inter-group agreement, refusing to engage in any independent financial activities without the participation of its official partners. It is for this reason that the name of the Yokohama Specie Bank does not appear in any of the Japanese war loans to China, which were transacted by a semi-official group of banks with no restrictions on their liberty of action. In explaining the reasons underlying these independent Japanese war loans to China, Mr. Odagiri speaks with the fullest knowledge and authority, and without attempting to defend or justify his own position or that of his bank. Mr. Odagiri's statement is concise and to the point, a simple, straightforward relation of facts that no amount of hostile propaganda can set aside, or detract from. His statement for all practical purposes, reflects the attitude of the Japanese Government on an issue of major importance, in which not only the honor and good-faith of Japan is at stake but the honor and credit of the Chinese Government.

WHENEVER our thoughts turn to the problems of our neighbor, we cannot but appreciate the determination and courage of New China in tackling the hardest task ever faced by any nation, and although we have many difficult problems to solve in connection with our own affairs, the sympathy we feel for our Chinese friends in their troubles makes us only too willing to co-operate with and assist them.

Among the many problems China has to face, the financing of the national budget is one of the most important. It is reported that the national budget for 1929 provides for an expenditure of nearly half a billion silver dollars, but in view of the many vital reforms and expenditures necessary to carry out the program of the Central Government, it is unlikely that it will remain very long at that figure. Furthermore, there remains the difficult task of adjusting and financing internal and external loans, which, including interest in arrears, total nearly three billion dollars. In this connection, I would like to make some brief remarks on Japanese loans to China, in order that their position may be clarified in fairness to the parties concerned.

The total obligations of China to foreign nations, including the Boxer Indemnity, amount to a little more than two billion dollars, of which the proportions owing to various countries, are, Japan 32 per cent, England 20 per cent, France 11 per cent, and the United States 5 per cent, with the balance of 32 per cent distributed between different European countries.

Mr. M. Odagiri, Director of the Yokohama Specie Bank, Ltd., and Representative of the Japanese Group of the New Consortium

Outstanding Japanese loans and claims amount at the present time to 666 million dollars, excluding loans contracted between individual nationals or concerns of the two countries, which total 177 million dollars. The outstanding loans, including interest in arrears, can be classified roughly according to the original purpose of the issue, in round figures, as follows :—

1. For Railway Construction and Material	$211,000,000
2. For Administrative Purposes, including the refundment of old loans	$120,000,000
3. For European War Participation, including the purchase of arms and ammunition	$100,000,000
4. For Industrial Purposes; Forest, Mining and Mills	$ 82,000,000
5. For Telegraph and Telephone Services ..	$ 63,000,000
6. To Assist Banks ..	$ 32,000,000
7. For Boxer Indemnity	$ 54,000,000
	$662,000,000

Since 1923, the annual payments of the Boxer Indemnity have been spent for cultural works in China. For this purpose a special bureau was organized in the Ministry of Foreign Affairs in Tokyo.

Before the Great War, China had been largely financed by British capital, and to some extent by other European countries and by America. Japanese participation in those years was rather limited. The first loan from Japan was the Imperial Chinese Government 5 per cent Railway Loan of 1911; the next the Reorganization loan of 1913, in which Japan participated to the extent of £5,000,000; then between 1915 and 1917, the Ssupingkai-Chengchiatun and the Kirin-Changchun Railway Loans were made. The majority of Japanese loans, however, were contracted about the time China declared war against the Central Powers. The interest of the European Powers in China had not decreased, but the difficulty of financing their own huge war requirements compelled them to restrict their activities elsewhere. Japan and the United States became, therefore, the only countries to whom China could turn for financial assistance. In 1916, Lee, Higginson & Co., the American International Corporation, Siems, Carey & Company and the Continental & Commercial Trust & Saving Bank, entered into various loan agreements with China, partly for the purpose of financing the Government, and partly for canal and railway construction. Japan's loan activities were naturally more lively on account of her geographical proximity to China and her keen interest in a country, in which she has always desired to make economic investments, to the extent that her financial resources would permit. This became gradually more feasible as her financial position improved during the war, and as China could no longer obtain capital from Europe, she turned naturally to Japan, whose capitalists, ready to avail themselves of the opportunity, concluded various loan agreements. From 1916 to 1918, several large sums were loaned to China, principally by the three semi-official chartered banks, the Bank of Taiwan, the Bank of Chosen and the Industrial Bank of Japan, whose advances totalled 177 million yen, as shown in the following table :—

	Purpose.	*Date.*		*Amount.*
1.	Bank of Communications	Sept. 28, 1917	Yen	20,000,000
2.	Chihli Province Flood Relief	Nov. 22, 1917	,,	5,000,000
3.	Telegraph Improvements	Apr. 30, 1918	,,	20,000,000
4.	Kirin-Huining Railway..	June 18, 1918	,,	10,000,000
5.	Kirin and Amur Province Forest and Mining	Aug. 2, 1918	,,	30,000,000
6.	Four Railways, Manchuria & Mongolia	Sept. 28, 1918	,,	20,000,000
7.	Shantung Railway	——	,,	20,000,000
8.	Arms and Ammunition..	——	,,	32,000,000
9.	War Participation	——	,,	20,000,000
			Yen	177,000,000

It is unfortunate that these loans should have created so much adverse comment in China and other countries, but I believe that the criticism levied against them is due largely to the fact that the circumstances under which they were arranged are not well understood. It may, therefore, be advisable to review briefly how these loans came to be contracted during that particular period.

The European war was then in full swing. It was impossible to predict the outcome. Japan, as one of the Allies, was facing a grave situation. Our national policy was to leave no stone unturned in order to bring victory to the Allied cause, and to that end it was important to induce China by all means possible to surrender her position of neutrality and join the Allies, for the reason that while her neutrality continued there was always a possibility that the enemy would take advantage of the situation and use China's vast territory as a base for active operations in the Orient. It was therefore urgent that China should be entirely free of German and Austrian influence, but with her finance crippled and her military strength inadequate, she was not in a position to attain that desirable position unaided. Loans for arms and ammunition, and to enable her to participate in the war, were undoubtedly necessary. These two loans and others subsequently arranged, relieved China of her financial difficulties and enabled her to organize well-equipped armies, to the point where she finally came to take an active part on the side of the Allies, and contributed towards making the Orient safe for their cause.

The war created another important problem for Japan. How was she to obtain the necessary supplies of raw materials for her industries ? Japanese industries have always depended upon foreign countries for their raw materials, such as iron, wool and cotton, but after the countries from which she was accustomed to draw her supplies entered the war, they were no longer in a position to spare a sufficiency of such materials to meet her requirements. This situation caused Japan to realize the grave necessity of fostering economic co-operation with China, so as to insure that an adequate supply of necessary raw materials could be procured in peace as well as in a future war. Some of the loans were made with the sincere desire and high ideal of promoting such economic co-operation and closer relations generally. The Bank of Communication Loan, for instance, was made to help one of the oldest Government Banks in China, out of a difficult position, the bank having a very large note issue with insufficient reserves, with the result that the notes greatly depreciated in value. Also, improvements in the means of communication were essential for the industrial development of China, and it was for that purpose that the Telegraph Improvement Loan was made. The Kirin-Huining Railway Loan was arranged for in the Kirin-Changchun Railway Convention of April, 1907, and again in the Chientao Agreement of September, 1909, the projected railway being intended to connect the great fertile plain of Manchuria with Northern Chosen. On October 5, 1918, the Chinese Government came to an agreement with Japan in a plan for co-operation in the construction of five railways in Manchuria and Mongolia, and in particular for the financing of the projects by loans from Japan, which was ratified by an exchange of notes. Four railway loans resulted from this agreement. The provinces of Heilungkiang and Kirin are adjacent to South Manchuria, where Japan has vital interests, and the Chinese Government had planned to develop their lumber and mineral resources but were unable to do so owing to lack of funds. They therefore requested the Exchange Bank of China to raise the necessary money in Japan to carry out their plans, and the Forest and Mining Loan agreement of September 28, 1918, was the result. After Japan captured Tsingtau from the Germans and obtained control of the Shantung Railway, it became imperative to construct the two extension lines, the concession for which had been granted to German interests, and this work was financed from the proceeds of the Shantung Railway Loan. Of the Chihli Province Flood Relief Loan no explanation is necessary, as its nature is self-evident.

Criticisms of these loans have been made because of the fact that the agreements were negotiated with a particular administration, namely, that in which Tuan Chi-jui was Premier, and also on account of misappropriation on the part of the borrowers. These loan agreements, however, grew out of nècessity, and followed a very natural and spontaneous course, to be repaid at a particular time, just as seeds of wheat sown late in the autumn grow to ripen in the summer.

The loans were arranged with whatever proper government was in power at Peking at that particular period. There was no motive for Japanese capitalists to favor any particular administration. They were actuated solely by an earnest desire to bring the two nations closer together in economic co-operation under the pressure of war necessities. It was with profound and sincere regret that we subsequently learned that the funds obtained from these loans had not been properly expended by China, failing thereby in realizing the original purposes of the loans. It was furthermore reported that the failure had been due to the absence of supervisory provisions over expenditures in the loan agreements. But under the circumstances in which the loans were made, it seemed inadvisable for the Japanese capitalists to interfere in the question of how the funds were used, nor would they have dared to do so.

I trust that these brief remarks have sufficiently explained the circumstances under which the loans were made. In conclusion, I should like to add a few words on Japan's present position and her desires with regard to Chinese financial affairs.

Japan's attitude towards China is simply to live up to the spirit of the New Consortium organized in October, 1920, to give financial assistance to China in order to see a stable government maintained and the country's economic resources developed as soon as possible.

Japan does not intend to make further loans unless conditions in China warrant such investment as a proper and safe financial transaction.

Therefore, since its establishment the New Consortium has had to remain inactive simply because the essential conditions under which it might function have not been fulfilled on the part of the Chinese Government itself.

If China desires to avail herself of the services of the consortium, which is always ready to act, she must, in the first place, endeavor to re-establish international confidence in the financial conditions of her country by putting her house in order politically and then making an honest attempt to straighten out her foreign obligations.

Japanese Investments in China

An Address Given at the Council on Foreign Relations, January 6th, 1931

By TOSHI GO, American Representative of South Manchuria Railway Company

Historically speaking, the economic relations between Japan and China date back to 1871 when the first Treaty of Commerce was concluded between the two countries. Since then, Japan's economic relations with China have witnessed tremendous changes through three distinct stages,—that is, the Sino-Japanese War in 1894, the Russo-Japanese War in 1904, and the World War.

It is better to divide our economic relations with China into these three periods and to point out the important phases of each.

The first treaty of commerce concluded in 1871 between China and Japan was based on an equal footing, each reciprocally permitting the nationals of the other to engage in trade at its ports. From that time on, Japanese trade with China saw a normal growth, her trade increasing from Y.15,000,000 in 1873 to Y.48,000,000 in 1893. With the increase of trade, Japanese steamship companies, trade firms and banking corporations began to enter China fields. In 1875 Mitsubishi Company opened their regular steamship service between Yokohama and Shanghai with the ships chartered from the Japanese Government. These ships were originally purchased by the Japanese Government from abroad for the use of their military campaign in Formosa. Soon Mitsubishi Company successfully emerged from the formidable competition with the Pacific Mail Steamship Company of America and the P. & O. Company of England, operating in the China seas, and eventually extended their operation to Newchwang, Tientsin and Chefoo in 1876. Mitsui Bussan Kaisha, our pioneer foreign trade company, opened their branch in Shanghai in 1877, and the Yokohama Specie Bank in 1893.

After the Sino-Japanese War of 1894-1895 the economic relations between Japan and China underwent a radical change. As a result of the war, Japan secured from China, by virtue of the Shimonoseki Treaty and the Peking Treaty, an indemnity of Y.360,000,000, a number of Settlements, Navigation Rights on the Yangtze River, Trade Rights in the Open Ports, Extraterritorial Rights, etc. These new acquisitions prepared the ground for Japanese commercial activities immediately launched in China. With the earnest assistance furnished by the Japanese Government and the tremendous efforts initiated by the Japanese people, Japan passed through a stage of industrial revolution during this period. It was during this period that the Japanese industries and particularly spinning industries came into existence in Japan. Our trade with China increased from Y.74,000,000 in 1896 to Y.142,000,000 in 1903; and, at the same time, the nature of the trade witnessed a radical change. In the exports, such industrial products as cotton yarn, cotton cloths, matches, copper, etc., came to occupy important positions, while in the imports, such raw materials and food stuffs as cotton, beans, etc., loomed up as important items.

With the development of trade, Japanese banks, trade firms and steamship companies made a great headway in China. Mitsui Bussan and Company opened, in addition to what I have already enumerated, their branch in Tientsin in 1896; and the Yokohama Specie Bank in Hongkong in the same year, in Tientsin in 1899, in Newchwang in 1900, and in Peking in 1902; while the Bank of Formosa opened their branch in Amoy in 1900. The Nippon Yusen Kaisha (Japan Mail Steamship Company) started their European and Australian lines, both making China as their principal ports of call; and the Osaka Shosen Kaisha (Osaka Mercantile Marine Company) opened their navigation on the Yangtze River in 1898 under a subsidy from the Central Government of Japan, and their South China service in 1899 also under a subsidy from the Government General of Formosa. No Japanese loan to China, however, was as yet in evidence up to this time, and the industrial investments of Japan in China were still insignificant.

The period from the Russo-Japanese War down to the World War must be examined closely.

Due to the assistance rendered by the American and British capital, Japan was enabled to finance her war with Russia; and also we were enabled to accomplish our post-war economic development. An instance of this fact was the establishment of the South Manchuria Railway Company. This Company, which I have the honor to represent in New York, opened their business in 1907 with a nominal capital of Y.200,000,000 of which Y.100,000,000 was furnished by the Japanese Government in the shape of railways, coal mines and their appurtenances obtained from Russia by the Treaty of Portsmouth, and with Y.2,000,000 paid up by the Japanese general public shareholders as the initial payment, and with a British loan amounting to £4,000,000.

Japanese loans to China began to appear about this time. The Industrial Bank of Japan made a loan of Y.4,000,000 to Han Yeh Ping Iron Mine in 1904. Okura and Company contracted the construction of the Kiukiang-Nanchang Railway in 1907, and also advanced a loan of Y.2,150,000 to the Kirin-Changchun Railway in 1909, Y.30,000,000 to the Chinese Government Copper Mint in 1910, and Y.10,000,000 to the Postal Administration Department of the Chinese Government in 1911 respectively. Moreover, various Japanese industrial enterprises came into existence in China, the most important of which being oil mills with Dairen as their center, and spinning mills in the Shanghai district. The Yokohama Specie Bank established their branches in Manchuria, North China and Central China, and the Bank of Formosa in South China, while the Bank of Chosen extended its business into Manchuria in 1913. In 1907 the Nisshin Kisen Kaisha (Japan China Steamship Company) was established as a result of the consolidation of the separate navigation services operated on the Yangtze River by Nippon Yusen Kaisha, Osaka Shosen Kaisha, Konan Steamship Company and Taito Steamship Company respectively. The Osaka Shosen Kaisha opened their lines between Osaka and Dairen, Antung, Yingkow and Tientsin in 1905, and their Formosa-Shanghai line and Formosa-Canton-Hongkong-Foochow line in 1911.

The Table No. 1 shows the development of Japanese investments in China during this period:

TABLE 1

	1907		*1914*	
	No. of Enterprises	*Amount of Capital Yen*	*No. of Enterprises*	*Amount of Capital Yen*
Agriculture, stock-farming, marine product industries ..	1,002	152,005	3,669	355,820
Coal mines	—	—	2	1,000
Electricity, electric-light, water works	4	2,380,000	5	2,416,000
Factories and mills	40	12,410,800	59	21,098.100
Railways and horse tramways..	1	134,763,791	3	252,763,949
Banks	6	24,499,000	8	49,750,000
Commerce	93	61,292,600	277	129,042,200
Miscellaneous	3	40,500	6	251,000
Total ..	1,149	235,538,696	4,031	455,678,069

In addition to the enterprises listed in this table, the eight branches of Japanese banking corporations having their head offices in Japan proper were conducting their business in China amounting to Y.46,579,500 in 1907 which in 1914 increased to a total of Y.362,401,265.

The third period was during the World War and after.

During the time of the World War the Japanese industries enjoyed world-wide markets, and the Japanese capitals made an epochal growth. Trade with China increased from Y.306,000,000 in 1915 to an enormous amount of Y.1,142,000,000 in 1919. Loans to China were practically monopolized by Japan, and no less than a total amount of Y.230,000,000 was advanced by Japan as new loans to China during the three years from 1917 to 1919. Various Japanese enterprises sprang up in the various parts of China, and the Japanese residents in China increased from about 100,000 in

1913 to about 240,000 in 1919. In 1917 the Bank of Chosen was granted the right of issuing banknotes in Manchuria, and the Oriental Development Company extended their operation into Manchuria as an agent financing real estate.

In the early part of 1920, however, the world-wide financial panic visited Japan, and her trade with China shrank from Y.1,142,000,000 in 1919 to Y.720,000,000 in 1921. Most of the Japanese enterprises in China sustained a staggering blow; and the loans of the Yokohama Specie Bank and the Bank of Chosen in Manchuria, for instance, shrank from Y.143,000,000 in 1919 to Y.88,000,000 in 1920. The number of the Japanese residents in China diminished from 240,000 in 1919 to 220,000 in 1923.

In this widespread deflation period, three Japanese enterprises carried on further development. One of them was the South Manchuria Railway Company, and the second was the Japanese spinning mills in China. The third was the Japanese merchant marine in the China seas. The South Manchuria Railway Company not only withstood this storm of depression, but actually accomplished their expansion. Their nominal capital was increased from 200,000,000 to Y.440,000,000 in 1920, and the further development of their great enterprises was pursued, including the extension of the wharves, installation of new blast furnaces at the Anshan Ironworks and construction of the Ssupingkai-Taonan Railway.

About this time the Japanese spinning industry in China embarked upon a prosperous career. Owing to the revision of the Chinese customs tariffs in 1919, the export of Japanese cotton yarns to China decreased from Y.119,000,000 in 1920 to Y.68,000,000 in 1921. As an effective means of rescuing themselves from this predicament, the Japanese spinning mills established their branch mills in China, thus increasing the number of the Japanese-owned cotton spindles in China from about 330,000 in 1918 to 960,000 in 1923, which was further increased to 1,300,000 in 1925.

The third important enterprise that was largely expanded in China in spite of the depression above-mentioned, was the merchant marine in the China seas. The tonnage of the Japanese vessels making calls at Chinese ports, which fluctuated about 15,000,000 tons during the period from 1913 to 1918, began to increase phenomenally in 1919, and reached 20,000,000 ton mark in 1921, and finally reached 26,000,000 tons in 1925.

From the above some idea of the history of Japan's economic growth in China may be obtained. Next, how Japan's investments in China stand to-day?

Japanese Loans to the Chinese Government

Since the advance of the loans to the Hsinmintun-Mukden Railway and to the Kirin-Changchun Railway, Japan's loans to the Chinese Government kept increasing up to the time of the World War. Among them are the loans to the Postal Administration Department in 1911, the Liquidation Loan in 1913, etc. After the outbreak of the World War, the European nations were compelled to withdraw from loan-making to China, and Japan almost monopolized the loan market with her capital steadily accumulated during this period. During the three years from 1917 to 1919 she made loans to China amounting to Y.230,000,000. Thus Japan came to occupy the foremost place among the financial powers to China. After the European War, however, Japan made only a few railway loans to China, such as the Ssupingkai-Taonan, Peking-Suiyuan, and Kirin-Changchun railways, and there were other loans, but these were merely the conversions of old loans into new ones and loans for the defaulted payment of interest. In other words, Japanese loans to China came to a standstill.

Exact figures of the Japanese loans to China are difficult to obtain, but Table No. 2 may serve to give some idea of the amount of the loans made to the Chinese Government as they stood at the end of each year from 1909 to 1928.

TABLE 2

	Thousand Yen		*Thousand Yen*
1909	2,470	1919	324,272
1910	5,452	1920	296,754
1911	15,434	1921	299,736
1912	15,417	1922	330,953
1913	79,190	1923	336,018
1914	79,172	1924	335,341
1915	79,154	1925	411,830
1916	91,913	1926	411,086
1917	131,245	1927	391,797
1918	306,013	1928	388,481

Han Yeh Ping Iron Mine Loan

In 1903, a contract was concluded between the Yawata Ironworks of the Japanese Government and the Chinese Government for the purchase by the former of iron ores of the Tayeh Mine, owned and operated by the Han Yeh Ping Company. Since 1914 the financial administration of this mining company was taken over mostly by the Yokohama Specie Bank, who has loaned to this company up to this present time Y.34,101,000 secured mostly from the Savings Deposit Department of the Japanese Government, and from the Bank of Japan, to the extent of Y.2,294,000. None of these loans have been liquidated, and since June 1, 1930, these loans secured from the above Deposit Department of the Japanese Government and also from the Bank of Japan were transferred to the Treasury Department of the above Japanese Government Ironworks.

Yuhan Kungssu Loan

In 1917 the Japan China Commercial Company entered into a contract with the Taochung Iron Mines in South China, thereby securing to themselves the exclusive rights of purchasing and selling the iron ores produced by those mines. In 1920 the Yedamitsu Ironworks of the Japanese Government took over the rights of purchasing the above iron ores, and through the agency of the Yokohama Specie Bank and the Japan China Commercial Company, furnished to the above Taochung Iron Mines the loans secured from the Deposit Department of the Japanese Government. These loans are given in Table No. 3.

TABLE 3

Date	*Amount* *Yen*	*Liquidated Amount* *Yen*	*Standing Amount* *Yen*
December, 1920	1,500,000	239,104	1,260,895
February, 1923	400,000	44,818	355,181
March, 1923	2,850,000	319,329	2,530,670
Total	4,750,000	603,252	4,146,747

These loans were also transferred to the Treasury Department of the Japanese Government Ironworks after June 1, 1930.

Kiukiang-Nanchang Railway Loan

In April 1907, the Industrial Bank of Japan secured Y.1,500,000 from the Deposit Department of the Japanese Government and loaned it to the Kiukiang-Nanchang Railway. This loan was subsequently taken over by the Japanese owned Oriental Enterprise Company in 1909, and since then this Company has advanced more loans to the above named railway as enumerated in Table No. 4.

TABLE 4

Names of Loans	*Year of Issue*	*Liquidation Amount* *Yen*	*Standing Amount* *Yen*
Oriental Enterprise *vs.*			
Kiukiang-Nanchang Railway Loan	1912	5,000,000	5,000,000
Ditto, First continuation Loan	1914	500,000	500,000
Ditto, Second continuation Loan	1914	2,000,000	2,000,000
Ditto, Third continuation Loan	1918	679,650	679,650
Ditto, Fourth continuation Loan	1922	2,500,000	2,500,000
Total (standing at the end of 1927)		10,679,650	10,679,650

Of the outstanding amount of Y.10,679,650 mentioned in the above table, Y.7,500,000 is due to the Industrial Bank of Japan, which secured the above amount of loan from the Deposit Department of the Japanese Government.

Japanese Loans in Manchuria and Inner Mongolia

Table No. 5 shows the loans raised in Japan by the Chinese Government, Chinese business companies and Chinese individuals for the purpose of investing them in Manchuria and Inner Mongolia, from which you will see how these loans increased year after year.

TABLE 5

Japanese loans in Manchuria and Mongolia, standing at the end of each year of 1909 and 1912, and from 1916 to 1917.

Year	Railways Yen	Mining and Forestry Yen	Electricity Yen	Miscellaneous Yen	Total Yen
1909	320,000	—	—	—	320,000
1912	320,000	—	—	90,000	410,000
1916	5,320,000	2,134,000	—	1,590,000	9,044,000
1917	11,820,000	5,397,000	—	1,590,000	18,807,000
1918	41,820,000	38,397,000	235,000	2,169,529	82,621,000
1919	41,820,000	39,099,072	346,000	3,611,998	84,877,070
1920	73,820,000	39,099,072	346,000	3,711,998	116,977,070
1921	73,820,000	39,099,072	481,000	4,136,998	117,337,070
1922	73,820,000	40,471,572	771,000	4,415,725	119,478,297
1923	81,817,081	40,471,572	771,000	5,208,725	128,268,378
1924	87,179,526	44,394,358	771,000	5,438,725	137,883,609
1925	93,479,526	45,915,180	771,000	5,736,424	145,902,130
1926	93,479,526	49,714,816	771,000	5,870,424	149,838,766
1927	102,009,945	60,562,072	1,154,958	7,964,221	171,691,196

The South Manchuria Railway Company

In this connection it is to be seen that so far as the number of the foreign residents in China is concerned, the Japanese people and the Japanese business firms occupy the unrivalled majority, among the latter the most outstanding one being the South Manchuria Railway Company and the Japanese spinning mills located around Shanghai, Tsingtao, Hankow and in Manchuria. As a matter of fact, these two elements represent more than half of the Japanese investments in China. Moreover, during the time when other various Japanese enterprises were in financial difficulties following the panic of 1920, these two enterprises achieved a tremendous growth. The Table No. 6 will show the year-by-year increase of the invested capital of the South Manchuria Railway Company since 1907 when the company opened their business until 1926.

TABLE 6

Date	Total amount of paid-up capitals, debentures and reserves Yen	Date	Total amount of paid-up capitals, debentures and reserves Yen
1907	134,763,791	1917	290,537,713
1908	179,515,777	1918	318,079,995
1909	181,979,681	1919	417,189,653
1910	238,382,932	1920	507,408,401
1911	220,879,995	1921	550,778,001
1912	230,466,344	1922	596,347,308
1913	244,504,801	1923	634,153,320
1914	252,061,949	1924	638,393,099
1915	259,646,067	1925	703,320,745
1916	268,011,634	1926	742,264,009

Japanese Spinning Industry in China

As has been mentioned already, the Japanese spinning industry in Shanghai, Tsingtao, Hankow and Manchuria, made a rapid development after the World War, and at present it is among the most important Japanese interests in China proper. All the spinning enterprises are entirely private and are not aided by the Japanese Government. Naturally, their success depends upon the internal conditions in China, and is subject to the policies of the Chinese authorities. Table No. 7 shows the development of this industry.

TABLE 7

Number of Japanese Owned Cotton Spindles in China.

Year	Number of Spindles	Year	Number of Spindles
1911	75,263	1924	1,058,928
1916	155,872	1925	1,303,816
1918	333,864	1926	1,318,312
1923	961,489	1927	1,329,508
		1928	1,370,763

Japan China Steamship Company

The Japan China Steamship Company was formed by merging the four Japanese steamship operations on the Yangtze River, so that they might more effectively compete with other foreign vessels navigating on this river. During the World War, the Japan China Steamship Company achieved a rapid development and is now a successful competitor with the two big British shipping companies, Jardine, Matheson and Company and Butterfield and Swire Company. The Table No. 8 shows the development of this Japanese shipping company.

TABLE 8

Year	Paid-up capital Yen	Tonnage of vessels	Remarks
1907	8,100,000	—	
1908	8,100,000	—	
1909	8,100,000	—	
1910	8,100,000	—	
1911	8,100,000	—	
1912	8,100,000	27,398	
1913	8,100,000	27,398	
1914	8,100,000	27,398	
1915	8,100,000	32,926	
1916	8,100,000	31,472	
1917	8,100,000	34,505	
1918	10,125,000	36,084	Opened Osaka-Hankow line.
1919	10,125,000	34,519	
1920	10,125,000	34,531	Opened South China coast line from Shanghai to Canton.
1921	10,125,000	41,217	
1922	10,125,000	44,160	Opened Ichang-Chungking Line.
1923	10,125,000	45,556	Extended as far as Hsuchow.
1924	10,125,000	45,556	
1925	10,125,000	42,025	
1926	10,125,000	45,753	Opened North China line.
1927	10,125,000	45,589	
1928	10,125,000	47,163	

Japanese Banking Corporations in China

Table No. 9 will show the growth of the Japanese Banking Corporation in China.

TABLE 9

Year	No. of Head Offices	No. of Branch Offices	Capital Yen	Deposits Yen	Lonas Yen	Net profits Yen
1916	14	13	5,860,000	10,987,708	12,455,071	580,587
1917	11	6	3,500,000	8,110,053	9,839,729	641,063
1918	21	28	13,770,000	32,243,614	44,242,195	1,699,904
1919	11	23	13,775,000	24,443,697	60,106,350	2,651,418
1920	10	10	13,775,000	8,328,096	19,071,235	2,780,612
1921	29	47	68,175,000	66,900,597	124,750,174	5,422,964
1922	29	47	68,175,000	66,900,597	124,750,174	5,688,360
1923	31	69	105,075,000	78,831,616	192,099,124	5,118,083
1924	26	43	89,700,000	67,754,814	153,629,936	3,010,052
1925	24	31	77,508,250	73,529,974	148,739,131	1,219,477

Japanese Firms in Manchuria and Inner Mongolia

These firms are shown in two categories. Table No. 10 shows those solely owned by Japanese, and Table No. 11 those joint concerns between Chinese and Japanese.

TABLE 10

(*a*).—Firms solely owned by Japanese

Year	Paid-up capitals Yen	Year	Paid-up capitals Yen
1906	105,105,000	1917	187,092,000
1907	105,664,000	1918	225,140,000
1908	107,323,000	1919	326,359,000
1909	107,889,000	1920	502,826,000
1910	108,129,000	1921	517,380,000
1911	111,951,000	1922	535,873,000
1912	123,220,000	1923	554,477,000
1913	137,474,000	1924	546,726,000
1914	142,798,000	1925	569,763,000
1915	150,025,000	1926	586,321,000
1916	164,147,000		

(*b*).—Firms under Sino-Japanese joint management.

Year	Japanese capitals Yen	Chinese capitals Yen
1907	637,000	363,000
1908	1,127,000	613,000
1909	1,108,000	632,000
1910	1,110,000	630,000
1911	1,556,000	594,000
1912	1,556,000	594,000
1913	2,138,000	612,000
1914	2,042,000	520,000
1915	2,550,000	425,000
1916	2,813,000	674,000
1917	4,580,000	782,000
1918	9,371,000	1,170,000
1919	18,417,000	2,733,000
1920	40,751,000	5,881,000
1921	41,351,000	5,042,000
1922	43,398,000	5,344,000
1923	42,675,000	4,939,000
1924	41,013,000	5,056,000
1925	43,470,000	4,827,000
1926	36,390,000	4,222,000

Loans to the Chinese Government

The Table No. 12 shows all the loans made by Japan to the Chinese Government. This table is quoted from *Japanese Investment in China,* compiled by Mr. Masunosuke Odagiri, formerly Director of the Yokohama Specie Bank.

TABLE 12

Name of Loans	*Year of Issue*	*Standing amount at the end of 1928 Thousand Yen*
Japanese share of the Liquidation Loan	1913	49,880
Bank of Communications Loan	1917	29,794
Forestry and Mining Loan to Kirin and Heilungkiang Provinces, and loan for payment of its interest ..	1918-22	58,234
Advanced payment on Kirin-Kainei Railway Loan ..	1918	12,625
Advanced payment on Tsishun-Kaohsu Railway Loan..	1918	25,600
Advanced payment on Four Railways Loan in Manchuria and Inner Mongolia, and loan for payment of its interest	1918-25	50,362
Loan for China's participation in the World War, and loan for payment of its interest	1918	38,895
Arsenal loan, and loan for payment of its interest ..	1917	62,443
Telegraph Loan, and loan for payment of its interest ..	1918-25	38,724
Ssupingkai-Taonan Railway Short Term Loan	1918	32,000
Ssupingkai-Chengchiatung Railway Loan..	1916	4,780
Postal Administration Department Loan	1911	12,738
Peking-Suiyuan Railway Loan	1917-25	17,871
Advanced payment on Telegraph Improvement Loan, and loan for payment of its interest	1910-16	13,398
Telephone Improvement Loan, and loan for payment of its interest	1919-23	22,559
Japanese share of 9 per cent interest loan for the liquidation of foreign and domestic short term loans ..	1922	37,675
Printing Office Loan	1918	4,216
Copper Mint Loan	1910	5,410
Miscellaneous Loans	—	36,033
Total		553,237

Table No. 12 includes neither the Chinese Government Bonds handed over to Japan in redemption of the Shantung Railway, nor the Chinese Government Bonds issued in redemption of the Japanese Government properties at Tsingtao and the Japanese Salt Industry in Shantung, nor the Boxer Indemnity.

Loans to the Chinese Business Companies and Private Persons

There are no publications available at present, but according to Mr. Odagiri, the total amount of the loans of this kind is put at Y.177,240,000 at the end of 1928.

Direct Investments

The Table No. 13 is the list of the Japanese investments directly made in China proper and Manchuria. These figures show the total amount of the paid-up capital, debentures issued and reserves, as a rule, but in the case of the spinning industries and a few other industries, the estimated values of fixed assets were presented. The loans made by the Japanese banks are omitted.

TABLE 13

Descriptions	*Manchuria Yen*	*China proper Yen*	*Total Yen*
Agriculture and forestry ..	22,407,000	6,500,000	28,907,000
Mining..	11,650,000	11,800,000	23,450,000
Power Plants	36,128,000	2,800,000	38,928,000
Manufacturing	105,611,000	196,688,000	302,299,000
Transportation	679,974,000	11,825,000	691,799,000
Financing	67,257,000	8,300,000	75,557,000
Commerce	117,753,000	45,890,000	163,643,000
Miscellaneous	51,243,000	3,134,000	54,377,000
Total ..	1,092,023,000*	286,937,000	1,378,960,000

* The total amount of Japan's investment in Manchuria alone, as it stood at the end of 1929, is put at Y.1.468,405,831, which is the latest available figure.

In this connection it is desired to draw your attention to the item of manufacturing in this Table No. 13. Of all the Japanese manufacturing industries in China, the most important one is the spinning industry. At the end of 1929, it counted 15 firms, with 40 mills, 1,442,840 spindles of untwisted yarns, 169,184 spindles of twisted yarns, 11,203 looms, and their fixed assets were estimated at Y.179,345,000. There is another item which merits your attention; the whole invested capital of the South Manchuria Railway Company was included in the figures under the caption of transportation in the Table No. 13, but as this company has invested in the various direct enterprises since their establishment, their investments are given in a separate Table No. 14.

TABLE 14

Fixed Capital of the South Manchuria Railway Company.

	Total of the invested amounts of enterprises standing at the end of fiscal year ending March 31, 1929 Yen
Railways..	249,703,000
Workshops	7,579,000
Wharves and Harbours..	69,204,000
Mining	106,719,000
Bean Oil Mills	4,936,000
Ironworks	20,871,000
Fertiliser Factories	80,000
Land Administration	167,169,000
Miscellaneous	45,490,000
Total ..	671,751,000

Japanese Culture Work

There is one more investment that Japan has made in China. It may not be proper to call it investment,—I mean our culture work. Table No. 15 will show what has been spent in that field. The investments in schools, hospitals, and other cultural works established and carried on by the Japanese Government in the Leased Territory in Manchuria and by the South Manchuria Railway Company are excluded from this table, because the former are the part of the governmental administration, and the latter were already included in the invested capital of that company in Table No. 14.

TABLE 15

	Yen
Special Budget Fund for the Cultural Work in China	59,270,000
Estimated assets of the Dojinkai Hospitals (Tungjenhui) ..	3,065,000
Estimated assets of the Dobun Shoin College (Tunga Tungwenhui)	1,382,000
Total ..	63,717,000

In conclusion let me present to you the sum total of the whole Japanese investments in China.

	Yen
Loans	730,477,000
Direct Investment	1,378,960,000
Culture Work..	63,717,000
Grand Total	2,173,154,000

There are other loans in addition to the above, such as business loans made in China by the Japanese financial agents: the Yokohama Specie Bank; the Bank of Chosen; the Bank of Formosa; the Mitsui Bank; the Mitsubishi Bank; the Sumitomo Bank; the Oriental Development Company, etc., all of which have their head offices in Japan proper. Though no exact amount of such business can be ascertained, there is little doubt that it will amount to hundreds of millions of Yen. Furthermore, the Japanese Government properties in China are entirely omitted in this statement.

Finally, a few more words may be added as to the position China occupies in Japan's export market. Japan's export to China averaged during five years, from 1925 to 1929, Y.556,372,000 which is 26.6 per cent of her total exports. Incidentally, the Japanese exports to the United States of America averaged during the above-mentioned period Y.888,236,000 which is 42.5 per cent of her total exports. From this you will see Japan's absolute dependence for her economic life upon the China trade, as well as upon the American.

The Task of Sisyphus

Minister Soong's Budget

MINISTRY OF FINANCE

General Statement of Cash Receipts and Payments for the Fiscal Year Ending June 30, 1930

Receipts

I. Revenue:			
(1) Customs revenue		$275,545,215.61	
(2) Salt revenue		122,146,170.67	
(3) Rolled tobacco tax		36,566,506.41	
(4) Tobacco and wine tax ..		6,830,995.48	
(5) Stamp tax		5,426,844.40	
(6) Flour tax		3,924,260.69	
(7) Remitted by provincial governments		11,384,782.07	
(8) Profit on the operation of the Central Bank, and dividends on other bank stocks deposited to credit of National Treasury		566,598.35	
(9) Miscellaneous		21,309,161.17	
Total		483,700,534.85	
Less:—Deductions for the support of revenue services, and refunds of revenue		45,637,326.02*	
Net total			$438,063,208.83
II. Proceeds from borrowing:			
(1) Domestic bonds and treasury notes ..		90,510,656.13	
(2) Bank loans			
Total issued	$111,695,663.70		
Less:— Amount redeemed ..	106,587,831.55		
Proceeds ..		5,107,832.15	
(3) Bank overdrafts			
Amount at end of period ..	8,965,665.81		
Amount at beginning of period ..	3,641,443.67		
Increase during period		5,324,222.14	
Total proceeds from borrowing			100,942,710.42
Total receipts made available to finance payments ..			$539,005,919.25

Payments

I. Party			$4,617,000.00
II. Civil establishments of the National Government:			
(1) National Government Council and subsidiary organs ..		$1,832,830.84	
(2) Executive Yuan and subsidiary organs		29,867,066.49	
(3) Legislative Yuan and subsidiary organs		1,025,000.00	
(4) Judicial Yuan and subsidiary organs		446,540.86	
(5) Examination Yuan and subsidiary organs		605,000.00	
(6) Supervisory Yuan and subsidiary organs		611,000.00	
(7) Famine Relief		10,000,000.00	
(8) Subsidies			
Provincial and local governments ..	$5,802,691.83		
Others ..	903,052.39		
Total		6,705,744.22	
(9) Miscellaneous		472,430.22	
Total of civil establishments ..		51,565,612.63	
Less:—Refunds		95,135.65	
Net payments			51,470,476.98
III. Military establishments			245,445,112.72
IV. Transfers to local authorities from the Salt Revenue Inspectorate			35,565,198.84
V. Loan service, net amount			158,995,288.54
VI. Indemnity, net amount			41,252,970.16
VII. Net payments added to reserves and suspense items			1,659,872.01
Total payments			$539,005,919.25

*Including sums deducted by revenue services for their support as follows:
Inspectorate General of Customs, $22,860,816.55; salt revenue services, $13,571,617.66; and other tax offices $8,529,960.19.

With revenues of $438,063,208, the National Government of China has just about sufficient funds to meet its current debt obligations and maintain its military establishments. The National Government of China exists solely for the upkeep of the armies which preserve the fiction of its power. That its most important loan obligations are paid is due to the fact that the customs and salt gabelle, under foreign supervision, provide in round numbers, $400,000,000 out of the 438,000,000 that enters the national treasury. The loan services and indemnity payments call for $200,000,000 a year and the armies eat up $245,000,000, leaving a deficit of $7,000,000, on which to run the government.

The budget figures show that the civil and all other expenses of the National Government must be covered by borrowing from the native banks. The proceeds from bank loans, treasury notes and overdrafts for 1930, total $100,000,000, which brings the total receipts of the government up to $539,000,000.

An analysis of the budget indicates very clearly that the Nanking Government exists to-day solely because it has control of the customs, and salt revenues which account for over ninety per cent of its income. Further analysis of the figures show that the increase in the customs revenues from $133,000,000, in 1928 to $291,000,000, in 1930, has been made possible by the recent tariff autonomy treaties. Import duties in 1928 brought $72,000,000 into the treasury, while in 1930 they totalled $211,000,000—three times as much. The increase in the duties on foreign imports in three years of Nationalist rule provided the government with $140,000,000, additional revenue, which instead of being applied to public works has been swallowed up by the armed forces and in prosecuting civil wars. The ready concession of tariff autonomy on the part of the Powers in the hope that the increased revenues would strengthen the Nationalist Government and pave the way towards the industrial reconstruction of the country, has simply created another burden on foreign trade to support an army too weak to cope with the bands of brigands and communists which terrorize and ravage the interior.

The unreality of it all is apalling. One reads through the second annual report of the Minister of Finance and tries to fit his activities and honest efforts to establish a budget into the picture as it really is, and gives it up as a hopeless and futile task. There are no statistics in China, no sources of reliable information, no government reports, nothing on which to base a correct statement as to the actual number of soldiers under arms, or the number of bandits and communists roaming the countryside and preying upon the people.

We know that the armies of Generalissimo Chiang Kai-shek approximate nearly a million men, some 60 odd Divisions, and that they cost to maintain nearly $300,000,000, which obviously does not include the expenses of active warfare. We are informed through official news sources that there are 280 divisions of troops in China belonging to the various provincial war lords and semi-independent satraps who profess loyalty to Nanking. If Nanking, controlling the main sources of revenue, utilizes every cent of its income to support its military machine, where does the money come from to support the other two million men under arms?

Are they paid ? Are they fed ? Do they live off the country ? Does the military expenditure simply represent the cost of arms, munitions, equipment and other war material ? Where does the money come from to maintain such an army ? Where does it go ?

At the lowest calculation these must be 3,000,000 regular troops in the 280 divisions and independent commands under arms in China. If it cost only $100 (silver) a year to feed, clothe and equip these men, the total is $3,000,000,000, or six times the revenues of the National Government. Nobody knows how many bandits and communists there are under arms in the country, but it cannot be far from 2,000,000 men, who must also be fed, armed and clothed. Is it fair to assume that they also require a minimum of eight dollars silver a month for their existence ? Here we have another $2,000,000,000 that must be added to the cost of maintaining the troops, a total of $5,000,000,000 a year that the wretched, half starved, unhappy people of China must produce either in food, or cash in order that these armed hordes can exist in idleness. Where does this money come from ? How do they do it ?

Does Mr. H. G. W. Woodhead's exposé of the opium traffic in the *Shanghai Evening News*, supply the answer ? Wars have been fought for the control of the revenues derived from this illicit trade. Mr. Woodhead concludes a sweeping investigation into the opium traffic by asserting that it constitutes the main factor in perpetuating China's disunity ; that the militarists who still openly or tacitly defy the Nanking Government are, nearly all of them, financially interested in the opium traffic—"It is futile," he adds, "to talk about the reunification of the country while whole provinces are under control of the militarists who support themselves and their armies from the sale or transportation of opium." It stands to reason that these independent military satraps, cut off from the coast and the industrial centers, deprived of any share in the rich revenues from foreign trade, will leave no stone unturned to create their own revenues, in order to maintain the armies which perpetuate their power. When these predatory overlords can callously condemn to death by starvation millions of their own provincials, no question of humanity, or consideration for the welfare of the people, will restrain them from any course that will fill their coffers with money. The forced cultivation of the poppy by the farmers to raise the funds to pay for the armies of their overlords, helps us to understand how these satraps are able to defy Nanking and make impossible its task of pacification and unification. Mr. Woodhead advocates legalization of opium and the establishment of a government monopoly as the only way to get control of the opium traffic out of the clutches of these militarists. "When they can no longer pay their armies they will be uncapable of any sustained defiance of the Nanking Government."

It is one possible solution to the problem of China, one way that Nanking can raise the funds to enable it to establish its authority and hasten unification, without imposing further burdens on foreign trade or seeking outside financial assistance. If, Nanking is to succeed in suppressing banditry, communism, insubordinate or rebellious militarists, it can be accomplished only by discovering new sources of revenues to pay for the long drawn out campaigns. Unless these new sources of revenue are found, the cost of China's pacification must be borne by additional burdens on foreign trade, until the law of diminishing returns kills the goose that has laid the golden eggs, at the command of Nanking.

The only justification for any large foreign loan to China at this time, is to enable Generalissimo Chiang Kai-shek to suppress communism and banditry. The Powers have shown their friendship and sympathy with Nanking by agreeing to the tariff autonomy treaties which have enabled Nanking to maintain itself in power, but it is out of the question to expect them to advance huge loans to carry on unproductive military campaigns. The only further concession possible that will enable China to solve her problems with her own funds, is to consent to a suspension of the Opium Agreement, so that Nanking can fight the rebellious militarists and bandits with their own weapons. It does not sound right, but it is either that or nothing. The picture is very similar to that of 1927, when the Soviet was using China as a battleground against the Capitalist Powers, who could not retaliate to protect themselves without violating the sovereignty of China. Moscow could and did intervene in the affairs of China to injure Great Britain, America and Japan, but the latter could not defend themselves. To-day we have the picture of whole provinces, whole armies, being supported by the revenues from Opium, defying the recognized government and making impossible any program for unity, peace, reconstruction and restoration of law and order. Yet, the National Government, is not permitted by international treaty to strike back by creating an Opium Monopoly, that will divert the revenues from this traffic into its own treasury and enable it to wipe out this menace to its existence ! Unless something is done to enable Nanking to increase its revenues, there can be only one end to the story revealed by Mr. Soong's budget figures.

Where it will all end, time alone will tell. As long as Nanking controls the customs, salt and other revenues collectable at their source in the Yangtze Delta, the Government can discharge its obligations and maintain its credit position.

No outside loans are possible until some agreement is reached as to the payment of outstanding indebtedness, under some form of refunding or consolidated loan, secured on the customs and the salt. Mr. Soong says : "Every effort is being made to overcome the numerous and complicated obstacles to an early settlement, so that confidence in national credit may be restored and the way paved for the introduction of foreign capital." But it seems to us, that the road to the restoration of national credit, lies not in any adjustment of outstanding indebtedness, but in the suppression of banditry, communism, and demobilization of excess armies, as the first step towards a return to normalcy and productive work. If all the revenues of Nanking are now being diverted to this task, and no progress has been made in six months, it becomes increasingly evident that the present revenues are inadequate to cope with the problem. If China is to be pacified and united under some form of stable government, either the Powers must contribute financially to this task or stand aside and let Nanking take its own measures. If the creation of an Opium Monopoly will enable Nanking to finance this campaign of unification, so much the better for China and the rest of the world. The monopoly is already established in the interior, and the revenues are being used to defy and destroy the recognized authority. Let it work both ways and be through with it. China does not need a budget that cannot balance except by borrowing. She needs funds, and the longer present conditions are permitted to drift, the harder it will become for Nanking to make ends meet ; the more serious will become the burdens upon foreign trade.

Minister Soong's budget and his comments on the problems before his government is at least an honest effort to face and confess the facts. As we read, analyze and digest his figures, we cannot help but compare his task with that of Sisyphus, an endless, heartbreaking job, rolling up a surplus that is immediately transformed into a deficit by the military necessities of his government.—G.B.R

Behind the Extraterritoriality Barrage

A GRAND drive for the immediate and unconditional abolition of extraterritoriality before May 1, is now being conducted by the National Government. Conversations are proceeding apace with the representatives of the Powers. The greatest secrecy surrounds these negotiations. Occasionally, when some irrepressible M.P. feels constrained to ask a question as to how things are progressing in China, we get a noncommital reply from the Under-Secretary-of-State-for-Foreign Affairs, that leaves the situation just as befogged as it was before. The secrecy of the grave pervades the negotiations at Washington. By some legerdemain of high diplomacy, or departmental red-tape, the negotiations have been taken out of the hands of the American

Minister to China and transferred to the Secretary of State and the Chinese Minister at Washington, and precious little information as to what is happening is permitted to leak out.

We have been assured that the State Department remains firm in its determination to adhere to the recommendations of the Extraterritoriality Commission, providing for gradual surrender, and although there has been no official intimation from Washington of any change in this policy, a feeling of anxiety and uncertainty pervades the American community in China. For the past six months, two American citizens have been held captive and tortured by the Honan bandits and notwithstanding the exchange of 211 letters and telegrams, culminating in a final urgent protest from Washington, no serious attempt has been made by the Chinese military forces to effect their release. American ships are still fired upon with impunity as they voyage up and down the Yangtze on their lawful missions. Nanking is powerless to enforce law and order or extend protection to foreign lives and properties.

Foreigners have surrendered many privileges in order to assist Nanking to consolidate its power. Minister Soong, in his budget figures provides the proof that Nanking could never have survived without the increased revenues made possible by the tariff autonomy treaties and the other taxes on foreign manufactured products such as oil, rolled tobacco and cotton yarn. The budget also tells us that this is not sufficient. Nanking must find new sources of revenues, to maintain its armies. The import tariff or the special taxes on oil, tobacco, cotton yarn and other commodities, cannot be increased without diminishing the returns.

If Nanking is to carry on with its own resources, suppress banditry, communism and piracy and place itself in a position to extend protection to foreign lives and properties, it must have money. If no outside assistance is forthcoming, these funds must come from within. The only remaining sources of taxation are in the foreign Settlements. The only way to levy on this wealth and make it contribute to national unification, is through the unconditional abolition of extrality.

To the miner Powers, this sacrifice means nothing. It means little even to the United States with a total investment in the country of $210,000,000, of which at least $80,000,000 is missionary and educational. The British case is vastly different. They have an investment of approximately $1,750,000,000 to protect. The Japanese have a stake of nearly $1,400,000,000 with a large percentage of it in regions over which Nanking exercises only a nominal authority. Both British and Japanese interests have already contributed a large slice of their trading profits to the establishment of the National Government and it is hardly conceivable that they would now hand over full control of their huge investments as a final contribution to the National cause, without irrevocable guarantees as to their future status.

If Nanking can ignore the agreements of previous governments, declaring them unconstitutional, invalid and unbinding on the country, a precedent is created that the next Chinese régime will not hesitate to follow. The National Government may survive and perpetuate itself. It may be defeated by the same combination of circumstances that swept it into power. There is no assurance of the permanency of the Kuomintang dictatorship. Until its power is firmly established, it cannot give these essential guarantees ?

Can it consolidate its power without money ? Can it raise this money from domestic taxation ? Can it have recourse to a foreign loan ? Will foreign trade or industry stand any further burdens of taxation without bringing into operation the law of diminishing returns ? If it cannot, then, the only remaining hope of finding the funds to maintain its armies and defray the costs of pacification must come from the additional revenues that can be imposed upon foreign trade, industry, income and property in the Settlements and the levies upon Chinese wealth concentrated in these foreign territorial enclaves outside the jurisdiction of Nanking.

Is this what lies behind the extraterritoriality barrage ?

* * *

As an American we can view with more or less equanimity, the final surrender of all safeguards for the protection of foreign lives and properties. As far as Americans are concerned, these safeguards have disappeared in all parts of China outside of Shanghai and Tientsin, where our armed forces provide some measure of protection, and in Tsingtau, where a Japanese squadron watches over its own nationals and incidentally affords protection to all other foreigners. When two American citizens can be held six months for ransom, tortured, half starved and otherwise maltreated, without the American Government concerning itself further than to bombard Nanking with telegrams of protest, in the full knowledge that Nanking is powerless to discharge its treaty obligations, it is time for all level-headed Americans to realize just where they stand. We might just as well sacrifice what is left, accept the inevitable, and get out. There is a fundamental principle of national honor involved, but in the world of to-day, principles that do not make for profits are not worth fighting for or getting excited about.

But there are other national interests involved in this surrender under whose protection Americans have resided, conducted business and reared our families, safe in the knowledge that our lives and properties would be protected and our treaty rights safeguarded. Americans have never taken advantage of China's weakness to extract territorial concessions ; we have never violated China's sovereignty. Nevertheless,we have been very careful not to establish our offices or homes in territory under Chinese jurisdiction—when we could possibly avoid it. We had no concessions of our own. We were not like those "land-grabbing Imperialistic European Powers and Japan," but we crowded into their preserves and accepted their protection. Even our banks and some of our consulates are located in other nation's concessions. The United States may be the great and good friend of China, but in our humble opinion, in this matter of extrality and the concessions, it is not up to Americans to take the lead in any movement for their surrender.

If the Japanese (who are most vitally concerned), the British and the French Governments, are willing to surrender their concessions and extraterritorial privileges, Americans who have the least to lose, could very well trail along, but to come out at this juncture and champion the policy of Nanking or take the initiative in surrendering these safeguards would be the height of ingratitude, a base betrayal of those who have sheltered and protected us, when our own Government declined to accept the concessions that were willingly granted by China.

True, we have equal rights in the International Settlement of Shanghai, but the initiative, enterprise and capital which transformed this mud-flat into a great city and port, was decidedly not ours. We may have equal rights in the government and future disposition of the Settlement, but it would not be fair to the others whose investments predominate, to emphasize these rights and attempt to dictate what the future of the Settlement is to be.

We have our offices, places of business, our few factories and godowns in the International Settlement, but perhaps a majority of the American business community have their homes in the French concession, where we have also erected our School and Community Church. We pay our taxes to the French Municipal Council and receive in return adequate police protection and public utility services. It is absolutely none of our business what attitude the French Government may assume towards the surrender of this concession and it ill-becomes Americans to interfere in the controversy, unless it be to support those whose hospitality and protection has been our one guarantee of safety against the lawlessness prevailing just across the Settlement border line.

We are approaching a show-down on extraterritoriality. Friendly negotiations may fail to bring about an immediate and unconditional settlement and China may have recourse to other measures. These may take the form of a severance of diplomatic relations, a show of force or a general boycott, but whatever they are, Americans can not stand on the side lines and remain neutral. Like every other right-minded American interested in the future of China, we entertain the most sincere and heartfelt sympathy with Nanking in its efforts to regain its sovereign rights. As Americans we have little to lose except the surrender of an antiquated face-saving principle which the present administration at Washington seems disinclined to uphold or defend, either independently or in co-operation with other Powers.

But after living and doing business for a quarter of a century under the protection of the other Powers, common decency impels us to support their diplomacy at a time, when surrender of their privileges means another heavy burden on their trade, loss of their investments and the handing over of their nationals to Chinese justice.

* * *

Other nations may entertain different views as to the necessity of preserving their conception of what constitutes one of the fundamental obligations of government and may reserve to themselves the right to enforce respect for their viewpoint. The subjects of Japan outnumber all other foreigners in China and in view of the many violent anti-Japanese agitations that have taken place in the last decade, Japan must receive the most ironclad guarantees that their lives and properties be protected before transferring this responsibility to Nanking.

Japan has many points of contact with China, many questions that must be settled before she can safely hand over her nationals to a government incapable as yet of enforcing its authority. It is not alone in Shanghai that the Japanese have settled. They are to be found in all the treaty ports, in every city and town in Manchuria, exposed at all times to the depredations of bandits and the mob spirit so easily aroused by glib-tongued anti-Japanese agitators. Japan has invested a billion yen in industrial enterprises in these outports which help keep her factories busy at home. She cannot afford in her present economic situation, to risk the loss of this invested capital and the trade it has created.

Americans can view with unconcern the abolition of extraterritoriality in these out of the way places, but Japan, directly and vitally concerned, must have some irrevocable pledges for the security of these investments and the lives of her nationals. Americans can afford to be altruistic. Our pockets are not deeply touched. But, if we had a billion dollar stake in China, we would characterize any move on the part of another Power to jeopardize our intersts as a rank impertinence, if not of open hostility.

There is much more behind the abolition of extrality than mere protection to foreign lives and properties. There is the equally important principle of reciprocal rights of residence, ownership of property and liberty to engage in trade, industry and agriculture. Chinese are residing in every city of the United States, amassing great wealth under the protection of the laws they are constantly defying. Chinese in the British colonial possessions monopolize certain lines of business and have created a millionaire class whose contributions to the Kuomintang have kept the organization going for more than two decades. Will Americans and Britions be conceded the same right to reside in the interior of China, engage in business and accumulate fortunes, protected by the laws of the country ?

These matters are perhaps of no immediate concern to Americans or the British, especially the former, who will have to expect reciprocity in their exclusion laws, but enjoying the same rights in China as the Chinese enjoy in the United States. But even Americans must have some guarantees that any treaty entered into along these lines will be faithfully adhered to by China. The Japanese obtained the right in 1915 to reside in, own and lease lands in Manchuria. Whether it was signed under duress or not, is beside the question. China signed it, and the edict went forth that any Chinese landholder who sold or leased his property to a Japanese, would be beheaded. The treaty stands but cannot be enforced.

China has signed a new treaty with Belgium, recognizing the right of Belgian nationals to reside in, own land and conduct buiness in all parts of China, yet we are warned by the spokesman for the Left Wing of the Kuomintang Party, that this treaty constitutes a rank betrayal of China's sovereignty and will be denounced when his faction gains control of the Government. The Left Wing may never triumph. The treaty may never be denounced or revised. It may continue in force like the Japanese treaty, a dead letter, impossible to give effect to its provisions by reason of some secret edict from Nanking.

Americans, whose only interest in China is reciprocal trade, may be willing to side-step this issue, permit some other nation to take the lead in negotiating a solution, and then demand the most favored nation treatment. Japan, however, cannot afford to take chances. She must insist that the interior regions of the whole of China be opened up for the residence of her nationals with equal opportunity for them to engage in trade, industry and agriculture. Japanese must be accorded the same privileges as the Belgians, on the basis of the most favored nation and their government must be given a pledge that the tactics employed to nullify the Manchurian treaty will not be repeated to deprive its nationals from the full benefits of the new treaty. With the best intentions in the world, Nanking, until it consolidates its power, could never give such a pledge.

Great Britain, the United States and France may agree to some program for the gradual relinquishment of their extraterritorial privileges in the interior and retain control over the International Settlement and the French Concession in Shanghai, but it is plain that Japan in self-defence, will be compelled to hold out against them, because of the greater and more important ramifications of her interests.

Japan sees the situation in China clearly. She has no illusions about the ability of Nanking to exercise control in Manchuria, North China or Mongolia. A treaty with Nanking can have no binding force on the military governors of Kirin, Heilungkiang or the newer Inner Mongolian provinces. If Japan once accepts Nanking's authority in these regions and signs a treaty based on this fiction, she will kiss good bye to her investments and surrender those vital strategic and economic interests in Manchuria, upon which her very existence as a nation depends. With the loss of Japan's special position in Manchuria, the whole edifice of foreign trade erected under the guarantees created by her presence in these regions, will crumble and disappear. China would be left alone to face a menace that in the next few years, will determine her fate.—G.B.R.

Roosevelt Acquires International Mercantile Marine

According to cable advices received by G. P. Bradford, Vice-President of L. Everett, Inc., General Agents in the Far East for the Roosevelt Steamship Co., operators of the American Pioneer Line, the interests identified with the Roosevelt Steamship Co. have acquired control of the International Mercantile Marine Co. and have amalgamated the two concerns. This, it is reported, constitutes the largest shipping combine ever made in the United States and brings into being one of the largest shipping concerns in the world.

The International Mercantile Marine Co. are old established operators on the Atlantic, principally with such large shipping ventures as the Red Star Line, the Atlantic Transport Co., the Leyland Line, the White Star Line and the Panama Pacific Line. The giant *Belgenland*, a frequent visitor to Manila on round-the-world cruises, is owned by the Red Star Line. The Panama Pacific Line have the big electric turbine steamers *Virginia*, *Pennsylvania* and *California* in the Panama Canal service between New York and San Francisco. The Atlantic Transport Co. own and operate a large fleet of vessels including the passenger liner *Minnetonka*.

The Roosevelt Steamship Co.'s operations up to the present have been confined to Government tonnage which they recently took over under lump sum charter arrangement, and include regular monthly services between the North Atlantic seaboard and the Philippines, China and Japan, a monthly service between the North Atlantic and Australia and a twice monthly service between the North Atlantic and various Indian ports including Calcutta, Madras and Bombay. The vessels comprising the fleets of these various services were all recently converted to diesel propulsion which increased the speed to between 13 and 14 knots, and the ships operating in the Oriental service are making the voyage between New York and Manila in the fast time of 38 to 40 days.

At the head of the new combine will be P. A. S. Franklin, now president of the I. M. M. and generally regarded as the most outstanding shipping man in the United States. Mr. Franklin's son, John M. Franklin, who has been a vice-president of the Roosevelt Steamship Co., will be a vice-president of the new concern as will Kermit Roosevelt, organizer and president of the Roosevelt Line, and Basil Harris, also a present vice-president of the latter concern. Vincent Astor who joined the Roosevelt organization as a director some time ago will likewise be a director of the new company.

The expansion plans of the new company include the acquisition of Government tonnage which is now in the course of rebuilding to shortly inaugurate a weekly passenger and freight service between Baltimore and Europe known as the Baltimore

(Continued on page 152)

"Sun Cheong"

American Engineering in China

IN 1906, three young Danes opened a one-room office at No. 2 Siking Road, in Shanghai, under the hong name of "Sun Cheong" ("Progressive, but Conservative") to conduct a general importing and exporting business. In those days the mainstay of the big foreign trading firms in China was the importation of piece-goods and the export of tea and silk. Every now and then the bottom would drop out of exchange, even as it does to-day, wiping out the profits of a good year of trading and throwing the importing firm deep into the red. Chinese dealers, when the exchange went against them, would refuse to take delivery of cargo or slip away to "Ningpo more far," and some trusting importer would find himself on the rocks. It was a fascinating gamble. It still is. As long as the bank credit or overdraft holds good they continue to play; but sometimes even the banks have to protect themselves and refuse further credit, and then another old-established house is forced to the wall and its name disappears from the Hong List. New capital may be found to carry on with, and the firm may get another lease of life, but the names that are carved deep on the tombstones of those who have tried to buck the Chinese trading game and failed, carry a warning and moral to the griffins who take their places. The money that has been lost in the gamble is many times greater than the gains.

Gradually, as new railway construction opened up the interior, and the Chinese began to take an interest in electric lights and other western mechanical contraptions, these general trading firms began to dabble in machinery, adding an "engineering department" to their piece-goods and "muck and truck" lines. It was an easy business to engage in. All that was necessary was to line up a dozen or more manufacturers who contributed a stipulated annual sum for "representation expenses" which paid the overhead of the engineering department, and the new enterprise was launched.

Mr. V. Meyer, President and General Manager of Andersen, Meyer & Company, Ltd.

We recall some of those "engineering departments" of a quarter of a century ago where machinery was sold from the catalog and the order sent to the manufacturer for "one electric light plant of 1,000 lamps;" "one piece locomotive;" "two pieces pumps"; "one box engines;" "one crate cotton machinery," etc; with references to manufacturer's catalogs and price lists. The Chinese purchaser didn't know what he wanted, and the "engineer" in charge of the new department, promoted from the "piece-goods" end of the business, in many cases, knew even less than the purchaser. The history of "Sun Cheong," issued in commemoration of its 25th anniversary, describing the old system, says "that the industrial development of the country was then in its infancy and few of the old hongs had specialized in engineering work. The bulk of the inquiries for engineering material came from the Central and Provincial governments, and were, as a rule, of a very general nature. Inquiries for electric lighting plants, for example, usually came in the form of a map (if available) of a city, with requests for prices on complete plant for 5,000, 10,000 or 15,000 sixteen-candle-power lights. The nature of the plant required, the proposed location, and other important details were seldom specified. The vague and meagre information available was generally referred by the hong to the home manufacturer, who, under the circumstances, had little knowledge of the conditions under which the plant was to be put to work, and consequently, in many cases, the machinery ordered was not adapted to the purchaser's requirements. Furthermore, the limited engineering staff and facilities of the hongs permitted only of contracting for sales on the basis of delivering the machinery at the wharves, and then letting it take care of itself."

At that time, twenty-five years ago, there were perhaps two foreign firms with a properly equipped and staffed engineering department, "Ewo" and "Soey Chee," with "Mow Sung" still in the ring, but temporarily crippled from one of the periodic piece-goods slumps. Into this field of activity entered the little Danish firm of Andersen, Meyer & Co., concentrating their energies on the usual piece-goods gamble, but sensing the opening for a properly organized and conducted engineering business. One of the partners, Mr. V. Meyer, with a clear vision of the industrial future of China, realized the importance of separating the engineering end of the business from the hazards of general commercial trading and building it up as a separate enterprise.

Within two years, two of the original partners, Mr. Andersen and Mr. Petersen, withdrew from the firm, leaving Mr. Meyer as its sole proprietor. In the meantime the firm had entered into an agreement with the old-established American hong of Fearon, Daniel & Co., whereby the latter was to finance an engineering department on a joint account basis. At that particular time the only American firm representing American machinery manufacturers, "Mow Sung," was passing through a reorganization consequent to heavy losses incurred in the piece-goods trade, leaving the field open for some energetic competitor to walk in and represent the major American machinery manufacturers. When Mr. Meyer visited the United States in 1907 he was successful in securing the exclusive representation for China of a number of well-known manufacturers of engineering equipment, amongst them that of the General Electric Co. As a result of these connections the new company was in a position to close, in 1908, its first large engineering contract for the equipment of the Mukden Electric Light Works.

Later on, in 1911, following another of the periodic piece-goods crashes, Messrs. Fearon, Daniel, & Co., was forced to withdraw from the arrangement, leaving Andersen, Meyer & Co. to carry on with the engineering lines. This left the Danish firm in the enviable position of being the representative American engineering organization in China, and by cutting adrift from the piece-goods gamble, and giving its undivided attention to engineering, it opened up a field of usefulness and activity that has since carried it to success.

"Ewo," the leading British trading firm in China, subsequently organized its profitable engineering department into a separate corporation in order to free it from the hazards of its export and piece-goods activities, and in so doing has preserved and expanded its usefulness and weathered the many financial storms that wrecked many of its competitors.

The little Danish firm labored under the handicap that its nationality and registry conflicted with the interests it represented, so in the spring of 1915, Mr. Meyer again went to the United States and incorporated the firm under American laws with the financial backing of the late Willard D. Straight and Galen Stone. With this influential American support and new capital the firm was enabled to secure the representation of many of the leading American machinery manufacturers and to extend its activities in China by establishing branch offices in the principal treaty ports. It then became a subsidiary of the Pacific Development Corporation and got tangled up in its war-trading activities and suffered the consequences of departing from the principle upon which the firm was founded. Like many other war-babies, the Pacific Development Corporation over-reached itself, and in making a loan of $5,000,000 to the Chinese Government in 1920, secured on the wine and tobacco taxes, it tied up its assets, and when the post-war slump came it left the holding company holding the bag. The Chinese Government has for all practical purposes repudiated the loan as no payments have been made against it to date, either as to principal or interest. In rendering financial assistance for the economic development of China the Pacific Development Corporation dug its own grave and nearly carried with it into oblivion the premier American engineering firm in the country.

In the crash of 1921, Andersen, Meyer & Co., as a subsidiary of the Pacific Development Corporation, paid the inevitable penalty of subordinating its engineering activities to general trading, and the firm would have passed out of the picture, like many other equally well-known and old-established hongs, had not the manufacturing interests it represented came to the rescue in order to save their outstanding accounts, carry through uncompleted contracts and preserve their footing in the market.

Under this reorganization, principally supported by the General Electric Co., the Baldwin Locomotive Works, Saco Lowell Shops, American Radiator Co., Worthington Pump and Machinery Corporation, and other engineering interests, the ownership of Andersen, Meyer was re-acquired from the liquidators of the Pacific Development Corporation and the firm given a fresh start. This new combination of purely engineering interests wisely returned to the fundamental principles of their business and decided to discontinue all side issues of general export and import and concentrate their activities and energies exclusively to engineering lines, a policy still in force and which has revitalized the firm and carried it forward to its present position as the best-equipped engineering organization in the Orient.

Through all its various ups and downs Mr. V. Meyer, the original founder of the firm, has continued in office as President and General Manager, and although its Board of Directors meet in New York, the Head Office remains in Shanghai. From a small trading firm doing business in a one-room office, on a side street, "Sun Cheong" has developed into a five million dollar engineering corporation, operating its own offices in China, New York and London, and employing over 100 foreign experts and 1,100 trained Chinese.

Space does not permit a detailed description of the many activities of an organization which comprises over twenty departments covering all branches of engineering. These departments embrace Textile Machinery; Power Plant; Electrical Installations; Domestic Refrigeration; X-Ray; General Machinery; Building Construction; Building Supplies; Plumbing and Heating; Agricultural Machinery; Drugs and Chemicals; and a manufacturing business which maintains a large machine shop together with a Window Sash Works. There are also various service departments to look after installations and guarantee their proper working after completion or delivery. The personnel of every engineering department includes one or more specialists in each engineering line handled by the department. The offices occupy a total floor space of 50,000 square feet, with elaborate show-rooms for each branch of engineering. Stocks are carried in a special warehouse and storage yards located at the river front, accessible to receiving cargo from the ship's side and for shipment to the outports. The number of items of spare parts and stocks carried is over 18,000.

Perhaps the greatest contribution of the firm to the advance of industry in China has been in the erection and equipment of textile mills. Prior to 1915 practically all of the textile machinery in the then existing mills was of British manufacture. By the end of that year, however, Andersen, Meyer & Co. had made arrangements to represent several of the leading American manufacturers of textile machinery and equipment and had sold the first cotton mill completely equipped with American machinery. Since that time there has been a steady flow of orders for new mills and extensions to old mills. At present there are about four million spindles operating in China, of which Andersen, Meyer & Co. has supplied approximately one-fifth. It has also supplied some 2,500 looms for weaving cloth and 1,500 knitting machines (out of a total of 3,000) for manufacturing hosiery. To give proper service to the Chinese mill-owners the Company maintains a complete textile machinery repair shop in Shanghai.

In the power plant department the company has made an equally splendid record, having supplied and installed turbo-generators together with other equipment necessary to make complete plants, to a total capacity of over 130,000 k.w. out of a total generating capacity of 600,000 k.w. for the whole country.

The firm represents a great wealth of American engineering resources, co-operating with it for the industrial development and advance of China. It has played its part in creating the phenomenal increase in the demand for and use of modern engineering equipment in China..

Its future is bright. Whatever may be said about the prospects of general trade in China, the main development of the country is bound to be along industrial and engineering lines. The firm that is specially equipped to meet these new conditions and devote its undivided time and attention to the problems of reconstruction is assured of success. "Sun Cheong" has set an example in the engineering trade that points a moral for all others who hope to participate in and profit from the development of China.—G.B.R.

Roosevelt Acquires International Mercantile Marine

(*Continued from page 150*).

Mail Steamship Line, and with which are identified such powers as the Pennsylvania and the Baltimore and Ohio Railroads.

No announcement has been made relative to further extensions of the present Far East service, but it is rumored that plans are afoot which contemplate the assignment of additional and faster ships and which might also include an improved passenger service. The vessels at present on the Oriental run are still owned by the United States Government and under charter arrangement with the Roosevelt Company, however it is confidently expected the Roosevelt Company will shortly purchase all of the vessels operating in the Shipping Board's American Pioneer Line.

The Roosevelt Steamship Co. is not to be confused with the Roosevelt Steamship Agency at Manila, agents of the Kerr and Silver Lines and the Java Pacific Line.

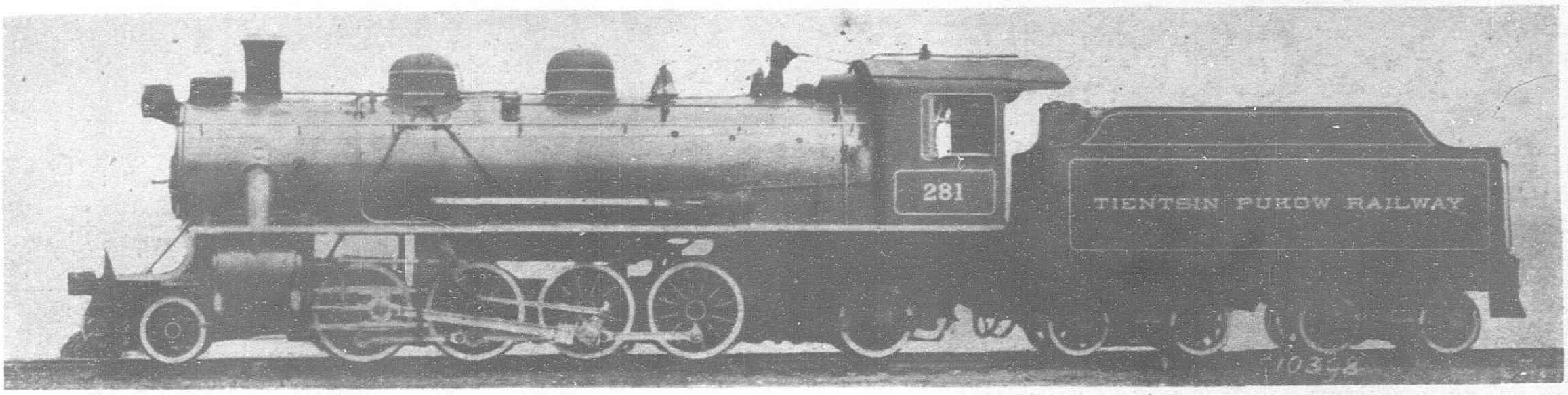
L. Everett, Inc., General Agents of the Roosevelt Steamship Co., are also agents of the Tampa Inter-Ocean Steamship Co., operators of the only regular freight service between the Philippine Islands and U. S. Gulf ports. They are also engaged in the inter-island trade on behalf of the Philippine Steam Navigation Co. and La Naviera Filipina, Inc., with such vessels as the *Kinau*, *Rizal*, *Kolambugan* and *Florence D* in the passenger and freight service between Manila, Cebu, Dumaguete, Zamboanga, Cotabato, Jolo, Davao, Legaspi and Tabaco.

New Locomotives for Chinese Railways

(Specially Prepared for "The Far Eastern Review")

The agreement to use the British Boxer Indemnity for the purchase of railway equipment manufactured in Great Britian, releases immediately £3,500,000, lying in the bank at Shanghai for this purpose. After educational grants of £465,000 are paid, the balance of the above sum is to be transferred to London to the credit of the Chinese Government Purchasing Commission to be used for the purchase of materials for the improvement and rehabilitation of the Chinese Government Railways. It is understood that the Chinese Government will also settle outstanding debts due to British merchants for railway materials, already supplied, which now amounts to over $20,000,000.

The British Government in 1922, agreed in principal to remit to China its share of the Boxer indemnity payments and since December 1, of that year, the payments have accumulated in the bank at Shanghai. On December 31, 1929, the total of these accrued annuities was £2,926,321. The annuities due under the agreement are as follows :—1921-31, £413,127 ; 1932-40, £596,481 ; 1941-45, £413,127 making a total of £10,176,931, available for railway rehabilitation, less the above mentioned amount for educational work. These funds are almost sufficient to rehabilitate the existing lines and complete the gap of 250 miles in the Canton-Hankow line.



Mikado 2-8-2, Type Locomotive Built by the Baldwin Locomotive Works for the Tientsin-Pukow Railway

Gauge	4′ 8½″
Cylinders	20″ × 28″
Valves	Piston, 11″ dia.

Boiler

Type	Straight Top
Diameter	65″ Inside
Working Pressure	200 lbs.
Fuel	Soft coal

Firebox

Material	Basic steel
Staying	Radial
Length	96 1/16″
Width	65¼″
Depth, front	76½″
,, back	58¾″

Tubes

Diameter	5⅜″	2″
Number	24	139
Length	16′ 3″	16′ 3″

Heating Surface

Firebox	154 sq. ft.
Combustion chamber	48 sq. ft.
Tubes—5⅜″	546 sq. ft.
2″	1176 sq. ft.
Firebrick tubes	23 sq. ft.
Total	1947 sq. ft.
Superheater	443 sq. ft.
Grate area	43.5 sq. ft.

Driving Wheels

Diameter, outside	54″
,, center	48″
Journals,	9″ × 11″

Engine Truck Wheels

Diameter, front	36″
Journals	5½″ × 10½″
Diameter, back	42″
Journals	7½″ × 14″

Wheel Base

Driving	15′ 0″
Rigid	15′ 0″
Total Engine	31′ 10″
Total engine and tender	59′ 3″

Weight—in working order

On driving wheels	147,300 lb.
One truck, front	20,900 lb.
On truck, back	36,600 lb.
Total engine	204,800 lb.
Total engine and tender	331,480 lb.

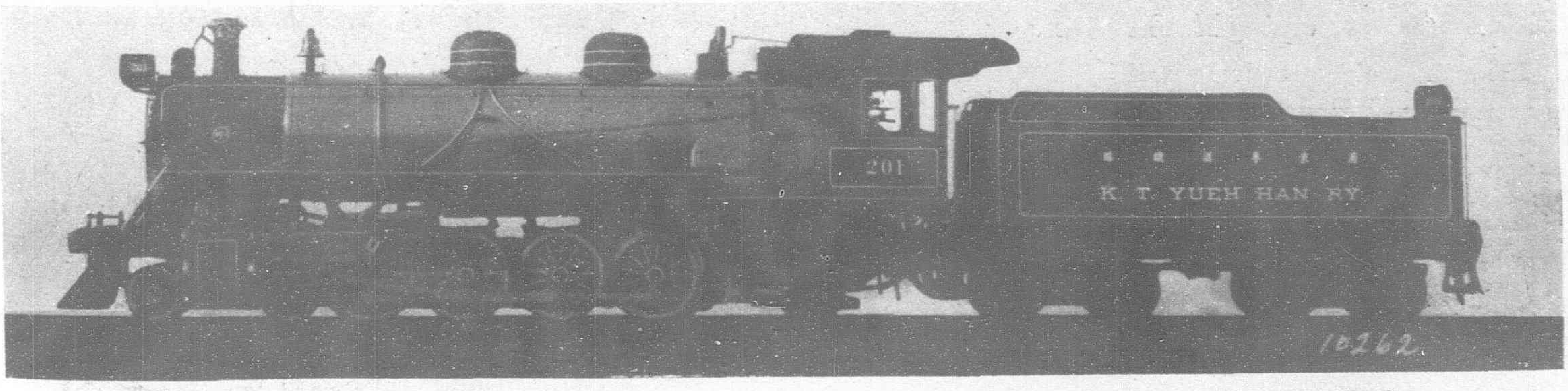
Tender

Wheels, number	Eight
Wheels, diameter	36″
Journals	5″ × 9″
Tank capacity	5,500 Imp. gal.
Fuel capacity	9 tons (2,240 lb.)

Tractive force	35,300 lb.
Service	Freight

Built 1929

Equipped with Type "A" superheater, and air brake on all driving and tender wheels, with one 8½″ cross-compound pump.



First Three Cylinder Locomotive on Chinese Government Railways, Built for the Kwangtung Yueh Han Railway

Gauge	4′ 8½″
Cylinders (3)	17″ × 24″
Valves Piston	8″ dia.

Boiler

Type	Straight
Diameter	68″
Working pressure	195 lb.
Fuel	Coal

Firebox

Material	Basic Steel
Staying	Radial
Length	96¼″
Width	66¼″
Depth, front	72″
Depth, back	61″

Tubes

Diameter	5⅜″	2″
Number	27	160
Length	19′ 0″	19′ 0″

Heating Surface

Firebox	162 sq. ft.
Tubes 5⅜″	719 sq. ft.
2″	1,585 sq. ft.
Firebrick tubes	19 sq. ft.
Total	2,485 sq. ft.
Superheater	584 sq. ft.
Grate area	44.3 sq. ft.

Driving Wheels

Diameter, outside	50″
Diameter, center	44″
Journals, main	9″ × 9″
Journals, others	8″ × 9″

Engine Truck Wheels

Diameter, front	30″
Journals	5″ × 9″
Diameter, back	30″
Journals	6″ × 10½″

Wheel Base

Driving	13′ 3″
Rigid	13′ 3″
Total engine	30′ 10″
Total engine & tender	59′ 3¼″

Weight

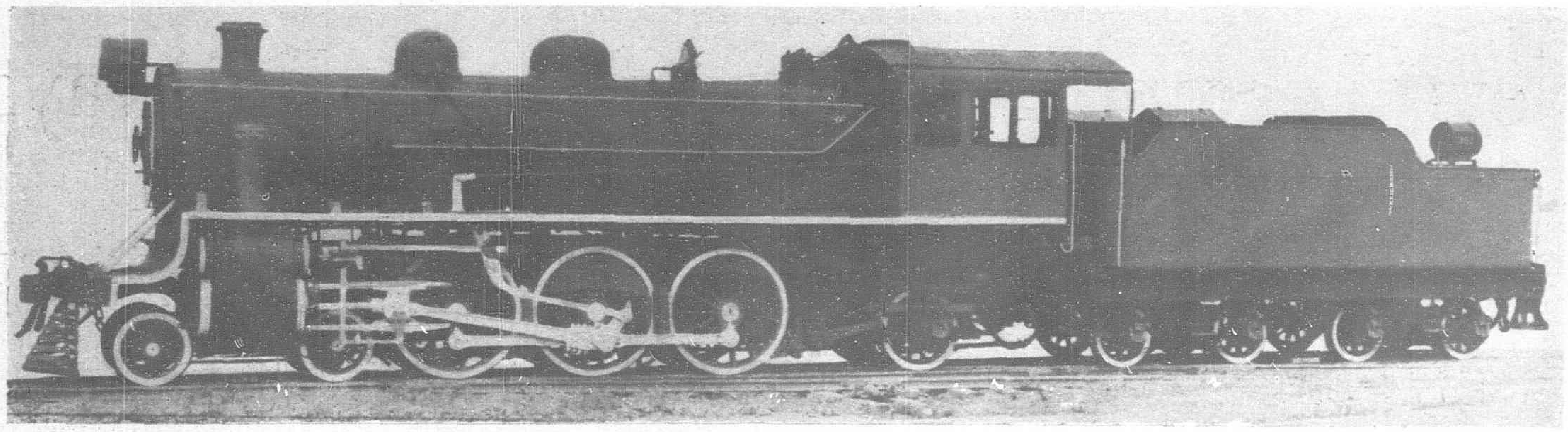
On driving wheels	129,850 lb.
On truck, front	28,550 lb.
On truck, back	27,560 lb.
Total engine	185,960 lb.
Total engine & tender	316,620 lb.

Tender

Wheels, number	Eight
Wheels, diameter	33″
Journals	3¼″ × 10″
Tank capacity	6,300 U.S. gals.
Fuel capacity	9 tons (2,240 lb.)

Tractive force	34,500 lb.
Service	Freight

Equipped with Type "A" superheater, power reverse, and air brake on all driving and tender wheels with one 11″ pump, left side.



Pacific Type Locomotive Built for the Kirin-Hailung Railway by the American Locomotive Company

Specifications: Gauge of Track—4′ 8½″; Cylinders—Diameter, 20″, Stroke, 26″; Driving Wheel Diameter, 62″; Boiler—Inside Diameter, 65″, Pressure, 180 lbs.; Fire Box—Length, 96¼″, Width, 65¼″; Tubes—Number, 133, 24 Diameter, 2″, 5⅜″, Length, 15′ 6″; Wheel Base—Driving, 11′ 0″, Engine, 30′ 7″, Engine and Tender, 57′ 9⅞″; Weight In working Order—Pounds, Leading, 40,500, Driving, 109,000, Trailing, 36,000, Engine, 185,500, Tender, 108,800; Fuel—Soft Coal; Evaporating Surfaces, Square Ft.—Tubes, 1,073, Flues, 520, Fire Box 192 Arch Tubes, 18, Total 1,803; Superheating Surface, Square Ft., 442; Grate Area, Sq. Ft., 43.6; Maximum Tractive Power—25,740 lbs.; Factor of Adhesion—4.23; Tender Type, 8-Wheeled; Capacity, Water, 5,000 Gals.; Fuel, 9 Tons.

It was estimated last year that the amount required for the physical rehabilitation of all the lines was approximately $60,000,000 silver or $25,000,000 gold, but continued warfare has increased the destruction of road bed and bridges and the deterioration of rolling stock to an extent that considerably augments the above figure. A full report on the rehabilitation requirements of the various Chinese Government railways was made by Mr. R. B. Mantell, the American operating expert engaged by the Ministry for this purpose. The reports of each individual line cover all the physical needs from road bed to workshops. Confining our extracts to locomotive rehabilitation, the report on the various railways says :—

PEKING-MUKDEN RAILWAY

This line has a total of 251 locomotives as follows :—

Under age 10 years	No. 103	20-29 ,, ...	No. 32
		29-35 ,, ...	,, 56
10-20 years, ...	,, 23	Over 36 years, ...	,, 37

There are 93 engines with an age of 29 to 41 years, representing a total tractive effort of 1,640,819 lbs. These were recommended to be scrapped, and 15 to 20 new Mikado type of 50,000 to 60,000 lbs tractive effort purchased. The cost for purchase of new engine power and rehabilitation of existing engines is estimated as follows:–

15 Mikado locomotives (Mex $120,000 each) ...	$1,800,000
85 engines rehabilitated at (Mex $5,000 each) ...	425,000
	$2,225,000

Peiping-Hankow line

The number of locomotives owned by this line is 229, of which 119 been seized by military leaders for operating their troop trains on other lines or held in Manchuria as spoils of war. The cost of rehabilitation of existing engines and purchase of new engines is placed as follows :—

Repairing 25 shunting engines at ...	... $2,000	$ 50,000
General overhaul 112 goods engines at	... $5,000	560,000
,, ,, 16 French passenger locos	@ $5,000	80,000
,, ,, 15 Belgian ,, ,,	@ 5,000	75,000
Purchase of 15 new engines @ $100,000 ...	...	1,500,000
		$2,265,000

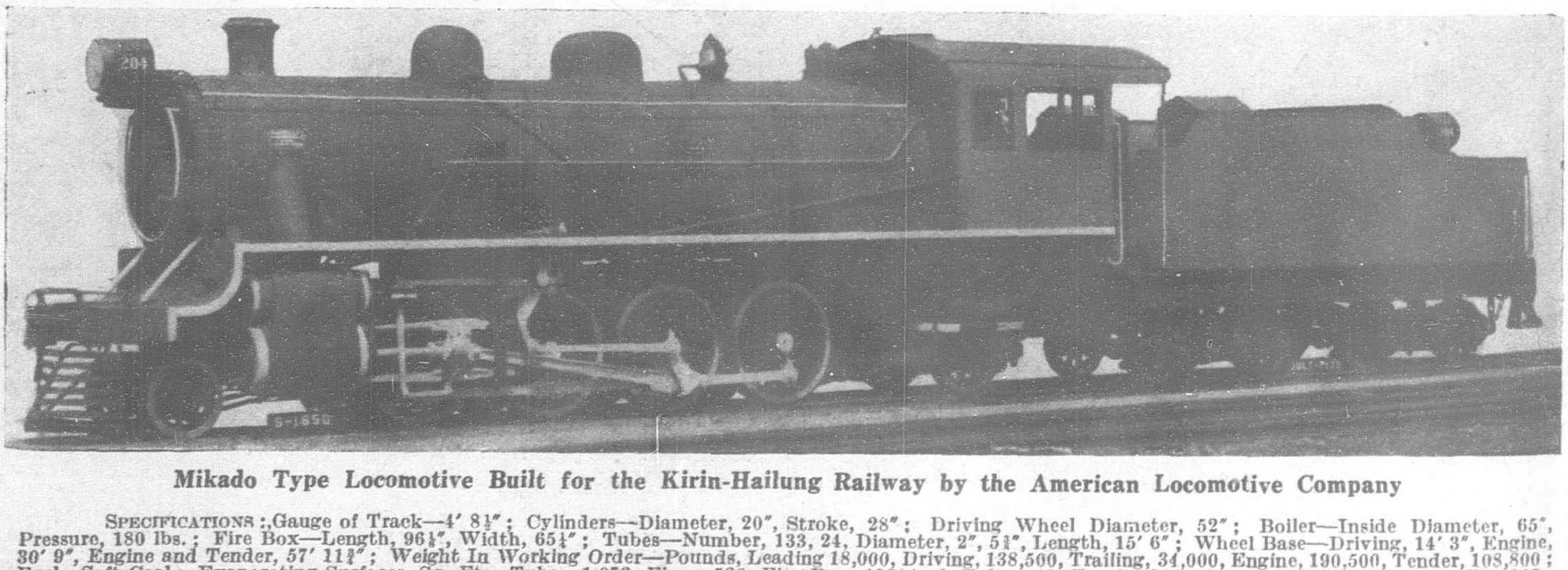
Canton-Hankow Railway, Northern Section

The rehabilitation for the locomotives of this line is estimated as follows :—

7	*Shunting engines* built 1910-1911-1916, tractive effort between 14,344 and 196,252 lbs.	$14,000
19	*Goods engines* built between 1912 and 1927, tractive effort between 25,543 and 37,752 lbs. ...	$66,500
8	*Passenger engines* built between 1916 and 1920, tractive effort between 23,600 and 26,600 lbs. ...	$28,000

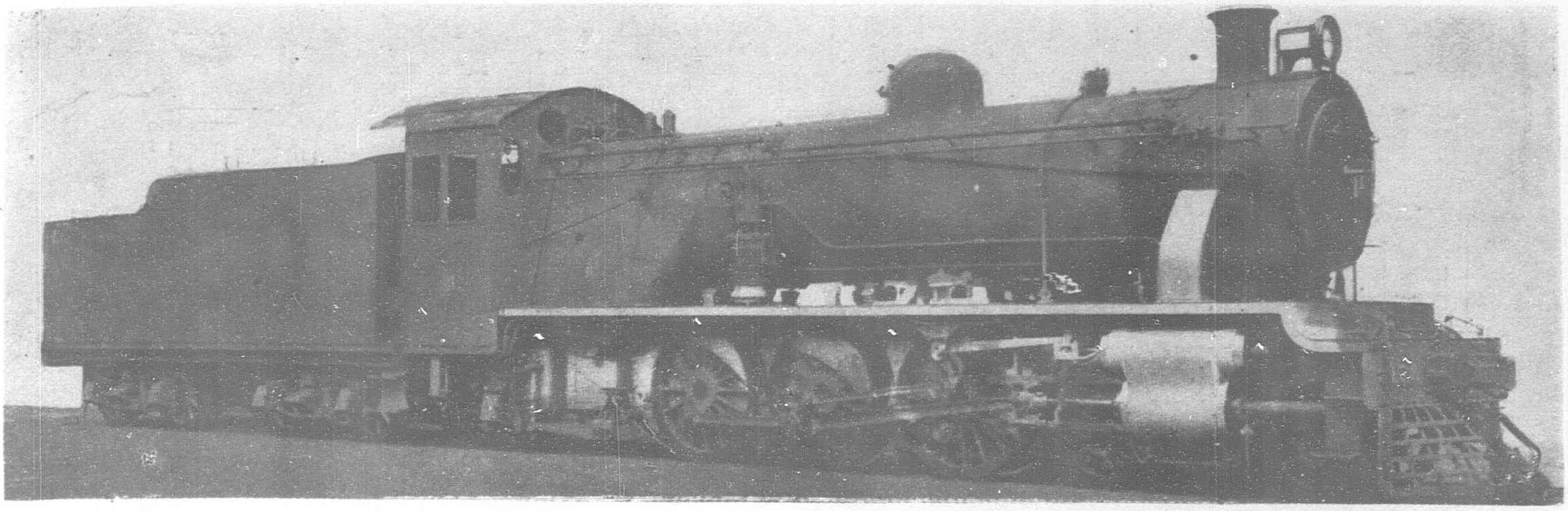
PINGSHIANG BRANCH

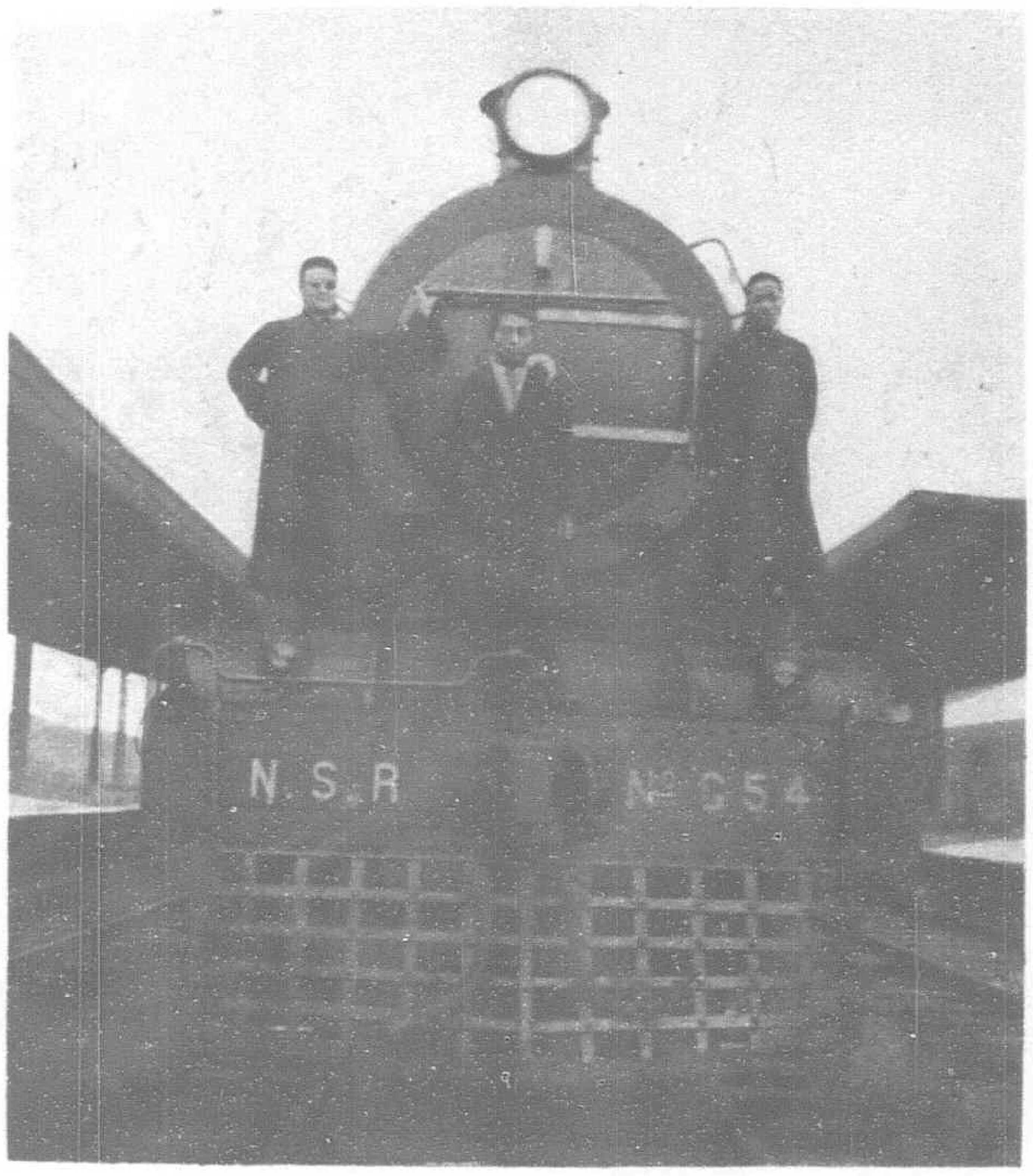
8	*Shunting engines,* built in 1904, should be scrapped	——
7	*Engines,* built between 1902 and 1913, half of these engines should be scrapped after branch line bridges are put in shape for heavier power	——
7	Engines @ $2,000	$14,000
		$122,500



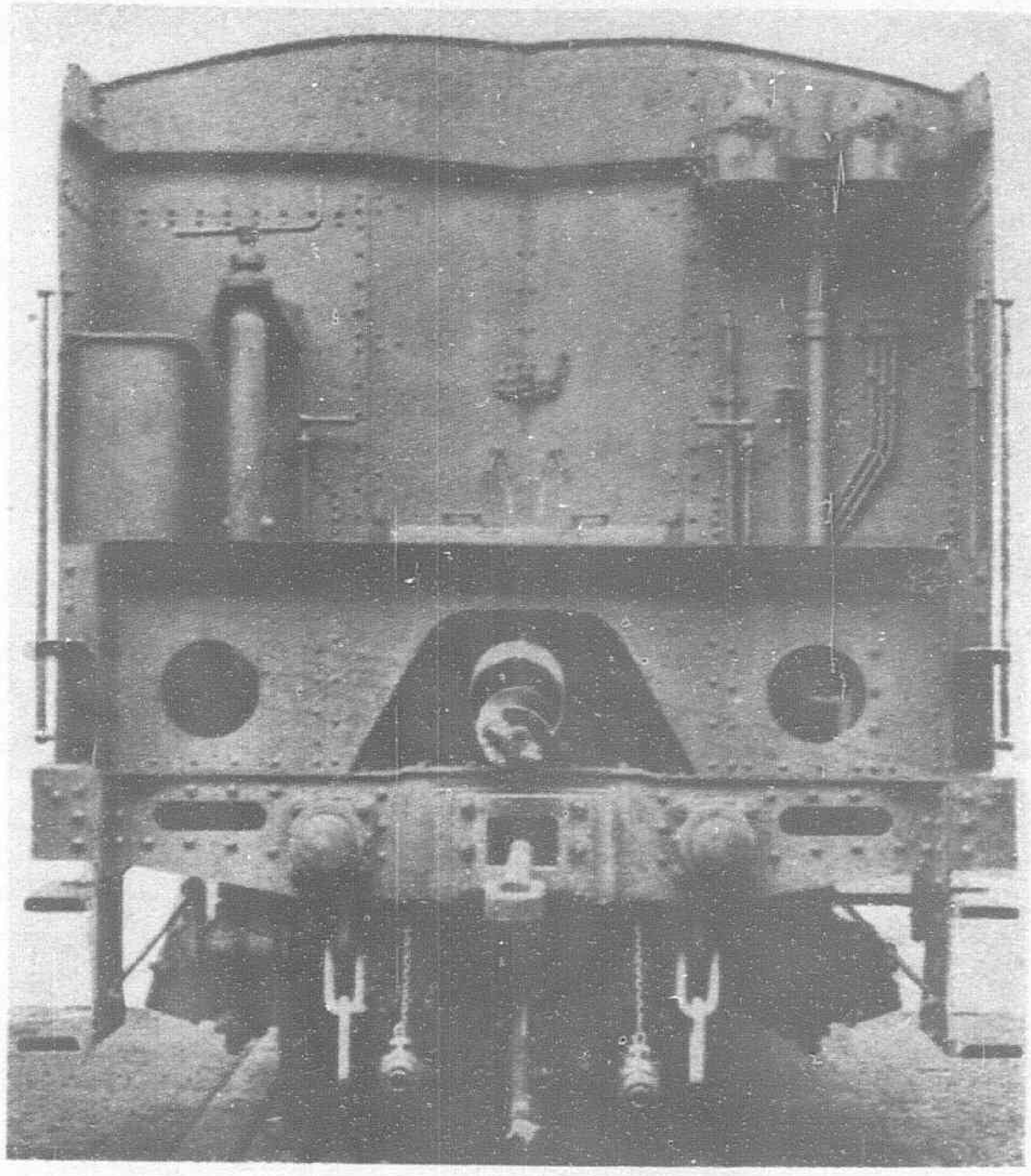
Mikado Type Locomotive Built for the Kirin-Hailung Railway by the American Locomotive Company

Specifications :,Gauge of Track—4′ 8½″; Cylinders—Diameter, 20″, Stroke, 28″; Driving Wheel Diameter, 52″; Boiler—Inside Diameter, 65″, Pressure, 180 lbs.; Fire Box—Length, 96¼″, Width, 65¼″; Tubes—Number, 133, 24, Diameter, 2″, 5¼″, Length, 15′ 6″; Wheel Base—Driving, 14′ 3″, Engine, 30′ 9″, Engine and Tender, 57′ 11⅞″; Weight In Working Order—Pounds, Leading 18,000, Driving, 138,500, Trailing, 34,000, Engine, 190,500, Tender, 108,800; Fuel—Soft Coal; Evaporating Surfaces, Sq. Ft.—Tubes, 1,073, Flues, 520, Fire Box, 192 Arch Tubes, 18, Total 1,803; Superheating Surface, Sq. Ft., 442; Grate Area, Sq. Ft., 43.6; Maximum Tractive Power, 32,950 lbs.; Factor of Adhesion—4.2; Tender Type—8-Wheeled; Capacity, Water, 5,000 Gals: Fuel, 9 Tons.





General View of 4-6-2- Type Locomotives for the Nanking-Shanghai Railway supplied by the North British Locomotive Co., Ltd. Front End View of Engine (Left) and Front End View of Tender (Right) showing Mechanical Stoker Connections. Bottom: View of Cab, Showing Fittings and Mechanical Stoker Connections



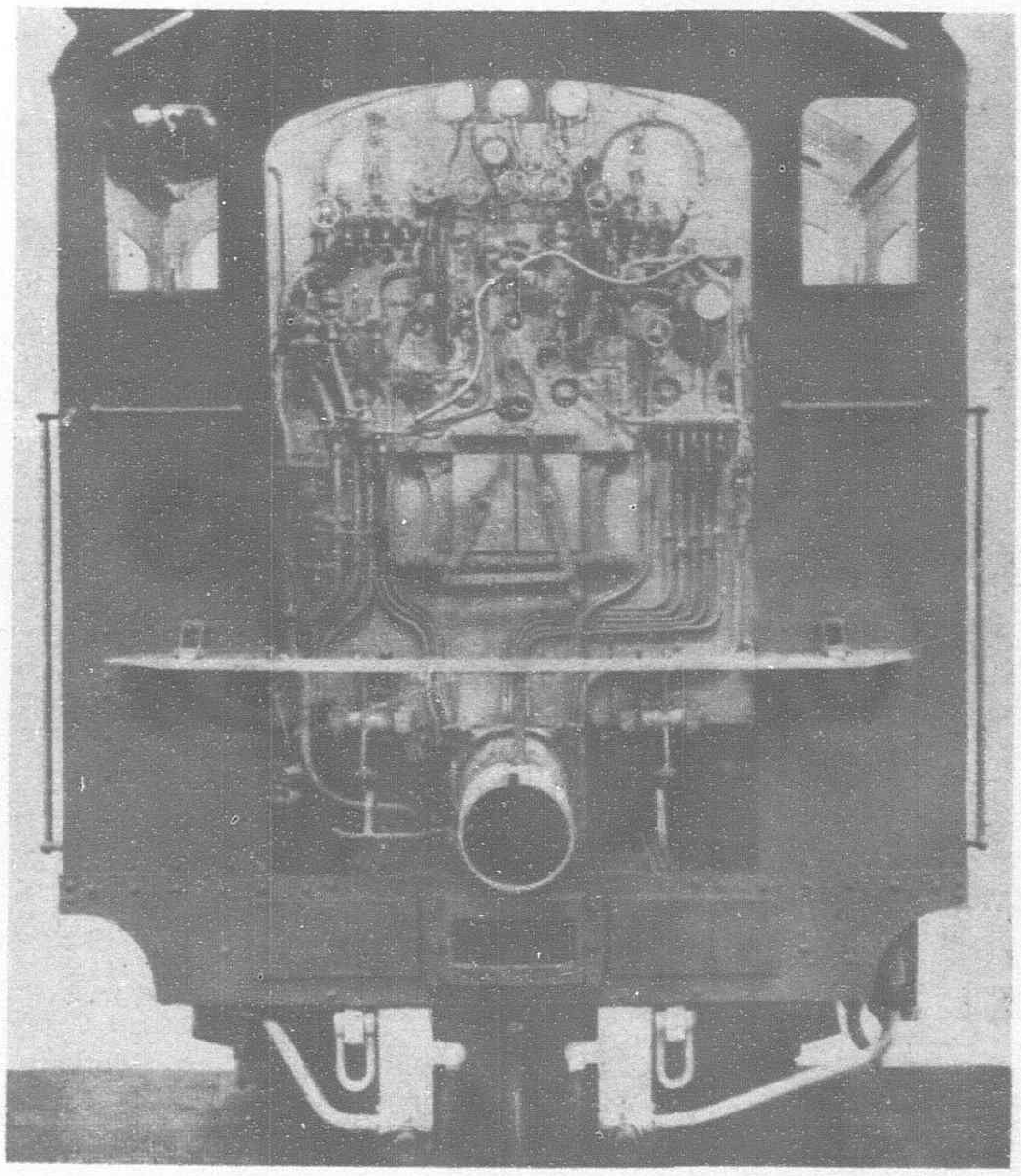
Canton-Hankow Railway, Southern Section

The Railway owns:—23 Locomotives built between 1907 and 1929.

6 Shunting engines built in 1907, 14,340 lbs. tractive effort, two of them being in such poor condition that they should be scrapped.

6 Mogul engines built in 1909; 24,100 lbs, tractive effort.
2 Mogul engines built in 1922; 25,640 lbs. tractive effort.
5 Composite engines built in 1914; 31,820 lbs. tractive effort.
4 Mountain type engines; 34,500 lbs. tractive effort; recently delivered.

Including the four new engines there are a total of eleven engines in service. The engines out of service need general overhauling, and the Railway lacks facilities to make repairs of this nature. Seventeen engines should be overhauled at $4,500 per engine. Total cost: $76,500.



Shanghai-Nanking and Shanghai-Hangchow-Ningpo lines

The purchase of six locomotives of the Mountain type with a tractive effort of 45,000 lbs. was recommended.

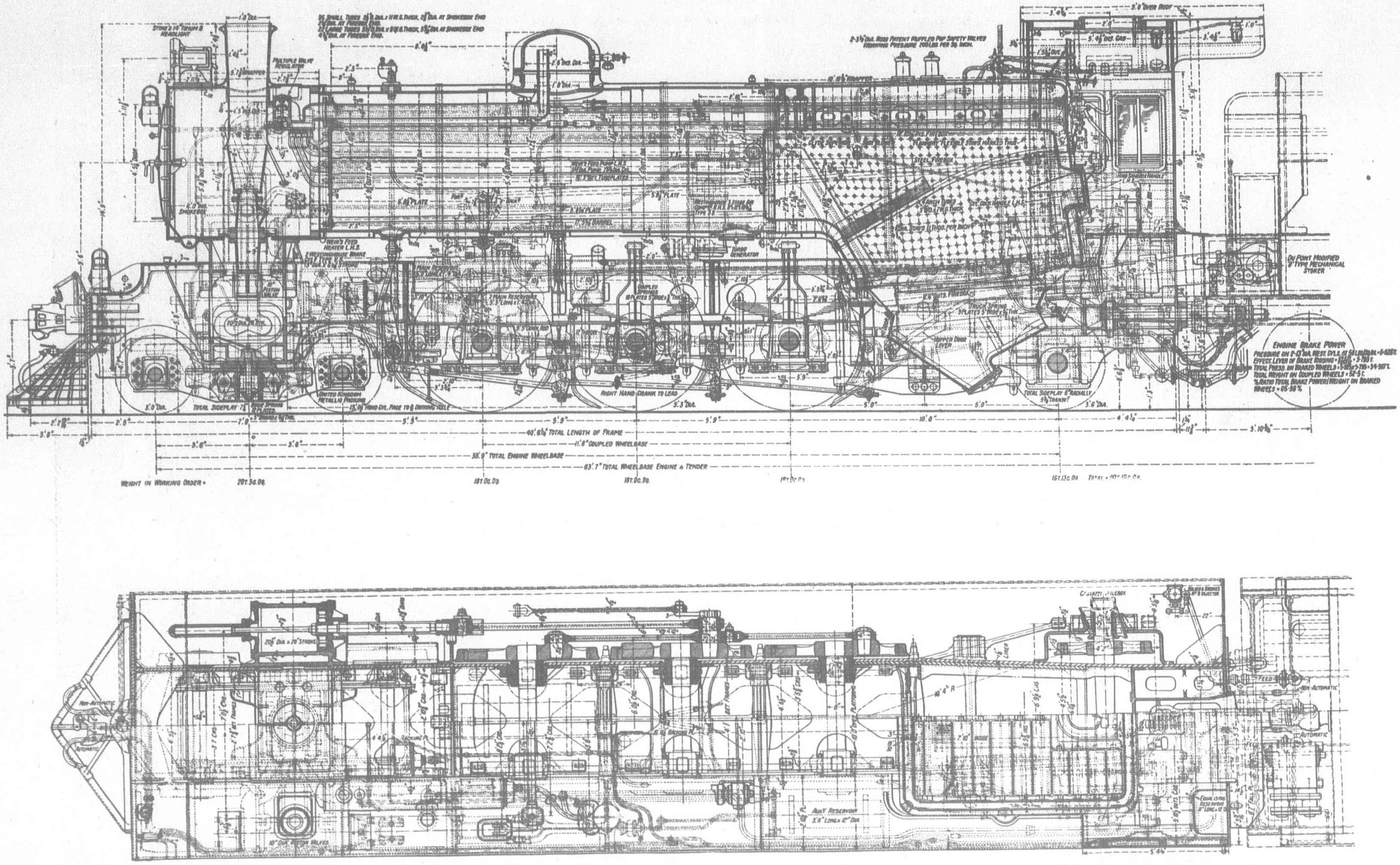
Tientsin-Pukow line

An inspection of all the locomotives of this line shows that they could be put in first class condition for $318,000.

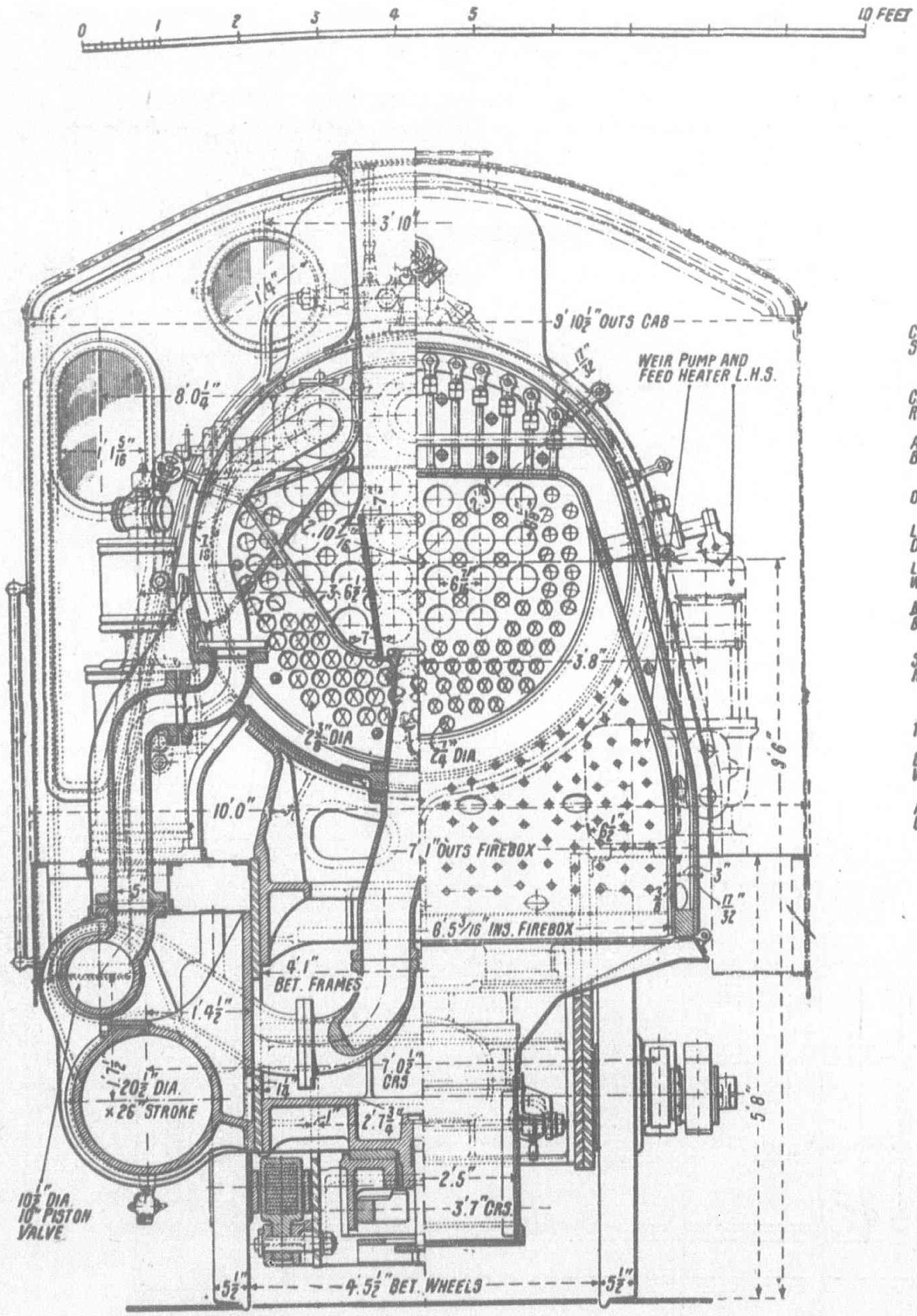
Peiping-Suiyuan Railway

LOCOMOTIVES.—The locomotives of this Line amounts to 138, of which thirty-five were delivered between 1905 and 1909, and consist of 15 shunting engines, 10 Mogul engines (built at Tangshan works), 6 Shay gear type locomotives, 4 Mallet type (North British Works).

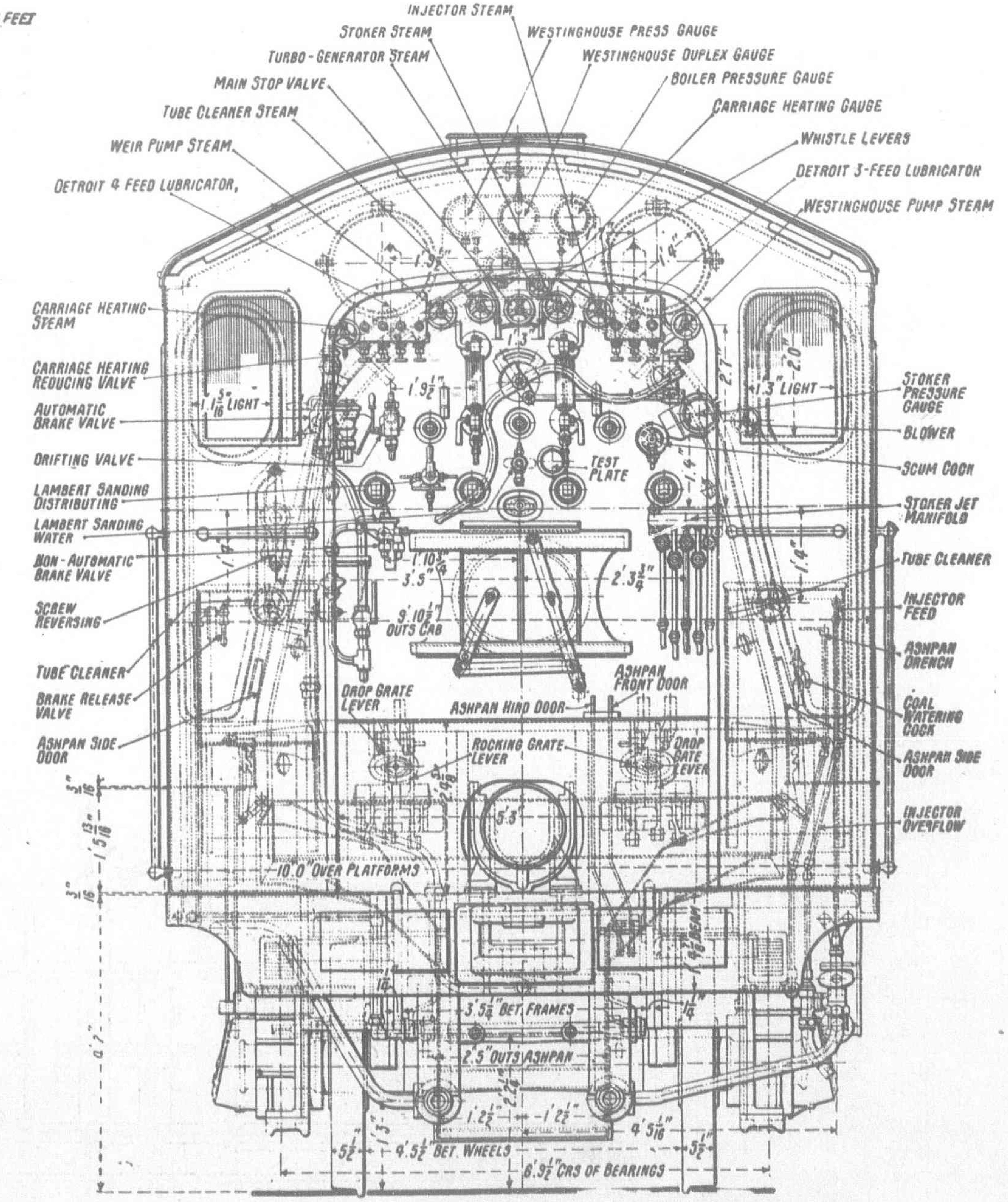
The balance, delivered between 1909 and 1922, consist of, 18 Mallet


Stone's 14" Turbo & Headlight
Multiple Valve Regulator
Reid's Feed Heater L.H.S.
Piston Valve
United Kingdom Metallic Packing
3'.0" Dia.
Total Sideplay 7½"
Right Hand Crank to Lead
5'.3" Dia.
Turbo Generator
Arch Tubes
Steel Firebox
8'.6" Outs. Firebox
Truck Spring 9 Plates 5" Wide
Hopper Door Lever
Total Sideplay 6" Radially 5½" Transv.
3'.6" Dia.
Du Pont Modified "B" Type Mechanical Stoker
Engine Brake Power
Pressure on 2-13" Dia. West. Cyls. at 50 Lbs.
Effect. Lever of Brake Rigging
Total Press. on Braked Wheels
Total Weight on Coupled Wheels = 52·5 T.
% Ratio Total Brake Power/Weight on Braked Wheels = 65·38 %
40'.6⅞" Total Length of Frame
11'.6" Coupled Wheelbase
33'.9" Total Engine Wheelbase
63'.7" Total Wheelbase Engine & Tender
Weight in Working Order =
20T.3c.0q.
18T.0c.0q.
18T.0c.0q.
18T.0c.0q.
16T.13c.0q.
Total = 90T.16c.0q.
20½" Dia. × 26" Stroke
10" Dia. Piston Valves
Aux. Reservoir
Equalising Reservoir
Feed
Non-Automatic
Automatic

Sectional Elevation and Plan of 4-6-2 Mixed Traffic Locomotive for the Nanking-Shanghai Railway. Built by the North British Locomotive Co., Ltd, Glasgow
(Reproduced from "The Railway Gazette," Nov. 1930)



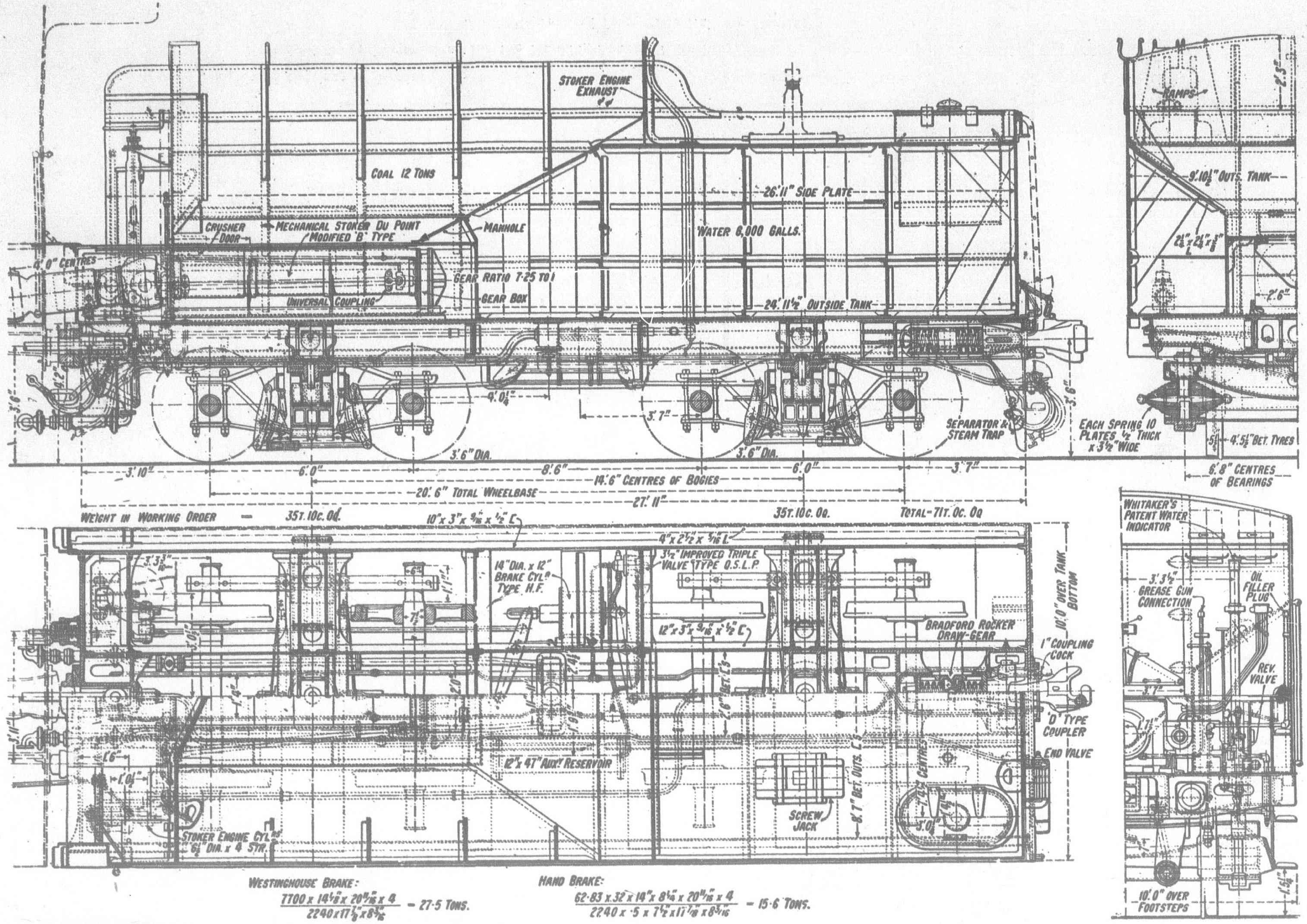
Half Cross Sections of Engine



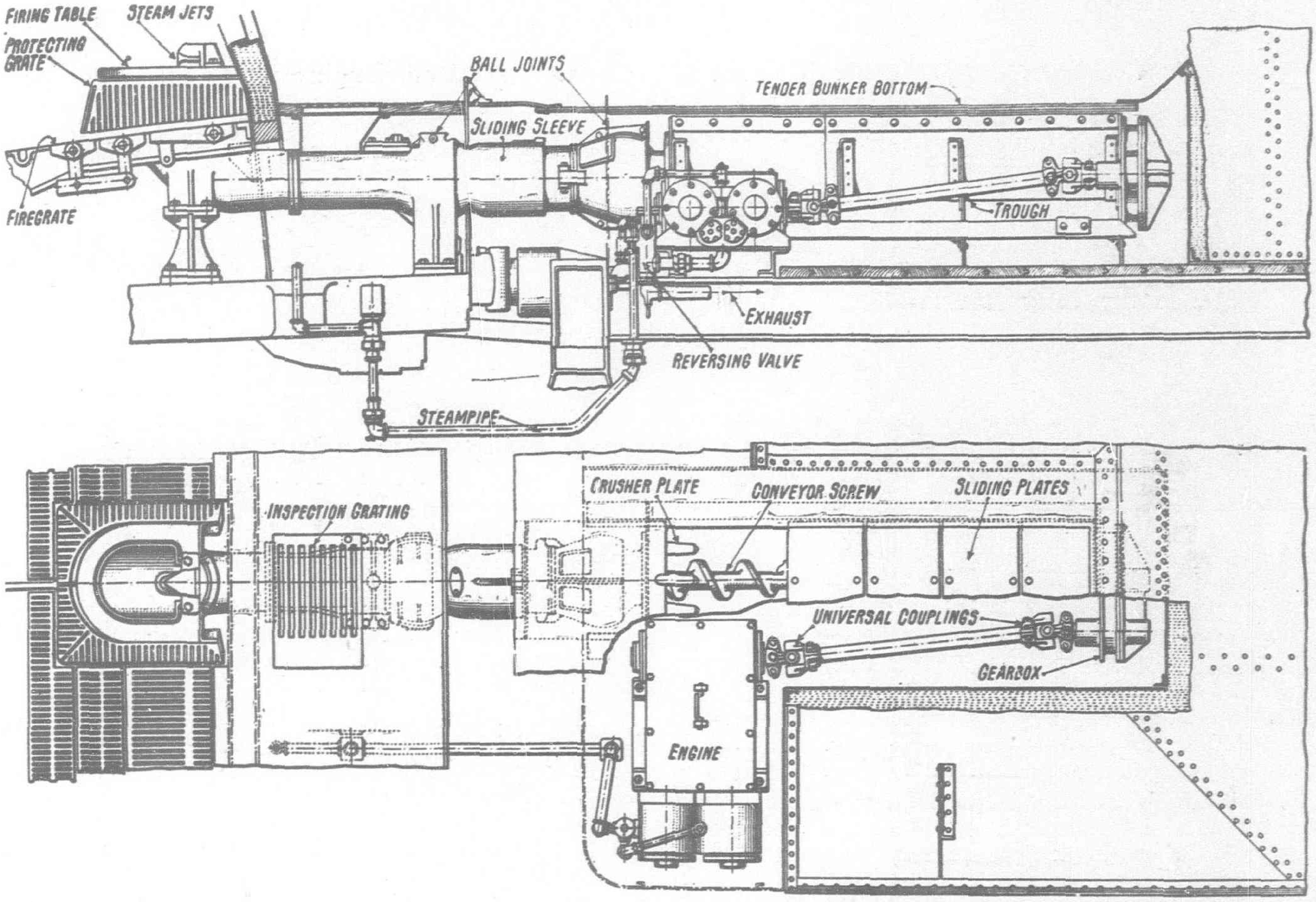
Engine Cab, Showing Fittings and Mechanical Stoker Connections

New 4-6-2 Type Locomotives for the Nanking-Shanghai Railway, Built by the North British Locomotive Co., Ltd.

(Reproduced from "The Railway Gazette")



Sectional Elevations and Plan of Mechanical-Stoker Equipped Tender, 4-6-2 Type Locomotives for the Nanking-Shanghai Railway. Built by the North British Locomotive Co., Ltd., (Reproduced from "The Railway Gazette")



Details of Mechanical Stoker with Engine and Tender Connections; *4-6-2 Locomotives for the Nanking-Shanghai Railway.* Built by the North British Locomotive Co., Ltd., (Reproduced from "The Railway Gazette")

type engines, 13 shunting engines, 20 Pacific type passenger engines, 6 consolidated engines, 46 Mikado engines.

Of the total ownership of the engines of this Railway, 53 are located in Manchuria north of the Wall, and consist of, 1 Shunting engine built in 1905, 10 Mogul type engines, 2 Shunting engines built in 1909 and 1921, 19 Pacific type engines, 21 Mikado engines.

It was assumed that all these engines will be returned to the Peiping-Suiyuan Railway, and the recommendations in connection with rehabilitation cost, and charges for improvement are as follows :—

3 Shunting engines built in 1906. These engines should be scrapped, and it should not be necessary to replace same.

6 Shay gear locomotivas built in 1909. These engines are absolutely unsuitable for operation on a line of this kind, and have not been in use for a long time. They should be scrapped.

4 Baldwin Mallet engines built in 1911. These engines have a tractive effort of only 27,400 lbs., and should not be perpetuated. The very light tractive effort combined with high cost of maintaining two engines in one, and the loss of efficiency due to their construction, etc., indicates that these engines should be scrapped.

4 North British locomotives of the Mallet type, built in 1908. These engines have a tractive effort of 56,407 lbs., and do not warrant being kept in service on account of heavy repair costs and light tractive effort which can be secured in one engine unit.

Total engines recommended to be scrapped :—17.

It was recommended that the other engines be perpetuated until such time as the line between Suiyuan and Paotow develops sufficient traffic to warrant the expenditure of money for heavier locomotive and heavier bridges. Of the 55 engines located north of the Wall, 42 are serviceable, and 11 were found to be unserviceable.

Considering a proper charge to rehabilitation affecting the engines north of the Wall, both serviceable and unserviceable, and engines on this railway that should come under this heading, it is estimated that sixty engines are in need of general overhauling, at an approximate average cost of $5,500 per engine, (including Mallet type), Total—$390,000.

Kiao-Tsi Railway

No recommendations were made for the purchase of new locomotives for this line as the increase of traffic will absorb all surplus engines.

Chinese Eastern Railway

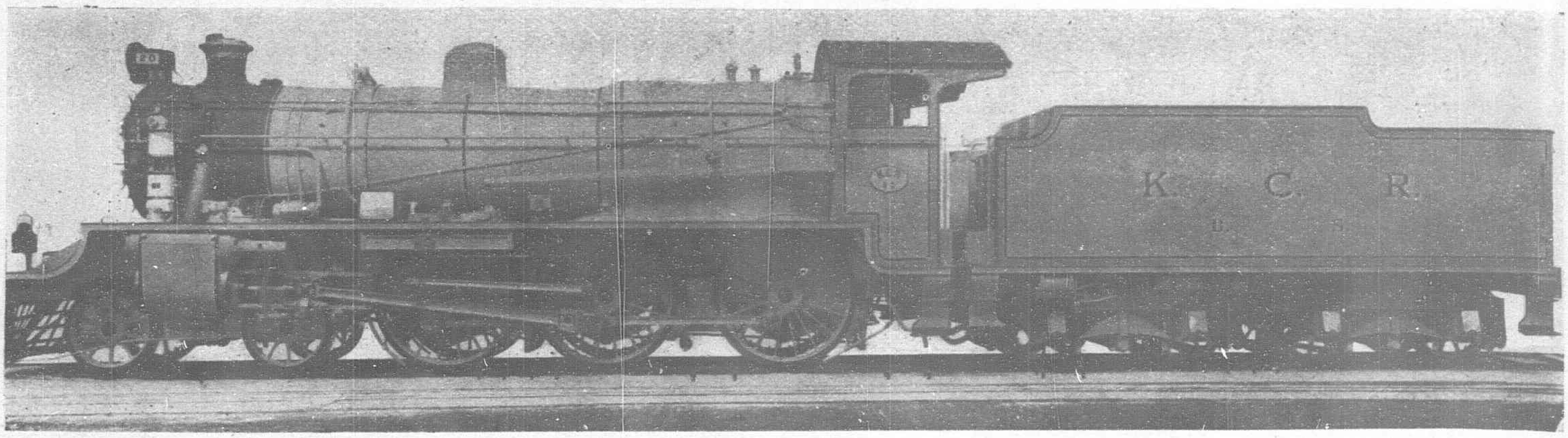
According to the latest reports, the Chinese Eastern Railway owns a total of 508 locomotives, of which 151 are in service and 244 are under repairs, the remaining 113 being beyond repair. There are 83 locomotives for passenger and goods traffic ; 209 are ten-wheeled, 13 eight-wheeled, 124 Decapods and 18 tank types. Owing to the political complications over the management and future status of the line, the Soviet directors are apparently making no effort to bring the rolling stock up to traffic requirements, while the monthly deficit in operating revenues is compelling the line to borrow from the banks to meet current expenses. The above figures would indicate that this line will be in the market for a large number of locomotives as soon as some definite agreement is arrived at between China and Russia. It may be, however, that the bulk of these requirements will be supplied from the Soviet Shops in Russia.

These reports of last year would indicate that the actual sum necessary to purchase new locomotives and repair existing ones, did not exceed $6,000,000 silver. Additional deterioration as a result of the civil wars combined with the enormous depreciation on the value of silver, will probably bring this total to at least ten million dollars at the present time.

Under the conditions that prevailed last year, that the Ministry of Railways has been able to make any substantial progress in the betterment of its lines is a high testimonial to the character of the men who are directing its affairs at Nanking. New locomotives and rolling stock have been acquired as finances have permitted, but the sum total of these purchases does not begin to cover even the urgent requirements of the lines. The early release of the British Boxer funds will enable the Ministry to proceed with locomotive replacement and repairs and once more place the existing railways in a position to handle the traffic of the country. The purchase of

4-6-0- TYPE LOCOMOTIVE FOR THE GOVERNMENT OF HONGKONG

Constructed by Messrs. Kitson and Company, Limited, Engineers, Leeds



locomotives by the Ministry of Railways these past few years has been overshadowed by the orders placed for the new lines in Manchuria. Most of these orders went to the Skoda Works of Prague (Czechoslovakia) and were distributed as follows :—

Hulan-Hailung Railway ...	... 7	Mikado Type	(2-8-2)
Chinese Eastern Railway ...	... 6	Tank Type	(2-10-2)
Tsitsihar-Keshan Railway .	... 24	Mikado Type	(2-8-2)
Ssupingkai-Taonan Railway	... 4	do.	(,,)
Mukden-Hailung Railway ...	... 24	do.	(,,)

Generally, it may be said that in the last few years the Skoda Works supplied all needs of the Railways in Northern Manchuria, with the exception of one Tank Type (2-10-2) locomotive for the Chinese Eastern Railway, four Pacific Type (4-6-2) locomotives for the Ssupingkai-Taonan Railway, supplied by the Mitsubishi-Kobe and the S. M. R. Workshops, Dairen, respectively, and four Mikado Type (2-8-2) Belgian locomotives for the Ssupingkai-Taonan Railway. About a dozen or so rebuilt old locomotives which had been in service at the front, were supplied by a British Importer to the Mukden-Hailung Railway.

Outside of these orders, the only important purchases were ten Baldwin Mikado (2-8-2) Type locomotives for the Tientsin-Pukow Railway ; two Baldwin 3-cylinder type for the Kwangtung Yueh-Han Railway, and the Mikado and Pacific types furnished to the Kirin-Hailung line by the American Locomotive Company. In addition to the above the North British Locomotive Company has furnished the Nanking-Shanghai line with eight (4-6-2) Pacific type engines and Kitson and Company, Ltd., have supplied the Hongkong Government with three locomotives for the through passenger service of the Canton-Kowloon line. Belgian makers supplied ten locomotives in 1929 (six for the Lung-Hai and four for the Shanghai Nanking Line) and four more in 1930 for the Shanghai-Nanking line. These locomotives, all of the consolidated 2-8-0 type, were financed from the remitted Belgian Boxer indemnity funds and built by The Ateliers Metallurgiques de Tubize. This makes, a total of 86 locomotives for Manchuria, and 37 for lines south of the Wall.

The British Boxer fund for railway rehabilitation is already being drawn upon by the Ministry of Railways for the purchase of material. A sum of £500,000 out of the Indemnity funds has been alloted to the Tientsin-Pukow Railway administration as a loan to be replaced in four years out of earnings with five per cent interest charges. The reorganization plan for this line provides for the purchase of eight new Pacific type locomotives and a number of passenger coaches.

As noted in the last issue of *The Far Eastern Review* an order for four locomotives for the Kao-Tsi (Shantung) Railway was recently awarded to the Mitsui Bussan Kaisha. These engines will be built at the Shakako Works of the South Manchuria Railway near Dairen. Two years ago, the same works completed an order for four Pacific type locomotives for the Ssupingkai-Taonan Railway.

The use of the British Boxer Indemnity for the improvement of Chinese Government lines will restore to British manufacturers their supremacy in equipment of all lines originally built from the proceeds of British loans, an equitable arrangement which the manufacturers of other nations cannot fairly criticise. In our opinion, under the old form of railway loan agreements, the Chinese were morally, if not legally bound to purchase the materials for the various loan built lines from the manufacturers of the nation supplying the funds, and we have always deprecated attempts to circumvent these obligations.

The breaking down of spirit of the loan agreements has resulted in the Americans holding the bag, while the British are again in a dominant position to supply the requirements of these lines and assured of cash payments against shipping documents, and a settlement of outstanding obligations, while the American debts remain to be paid under some form of consolidated loan, or an agreement as to new credits.

The placing of an order for new locomotives and rolling stock for the Kiao-Tsi railway with Japanese manufacturers, is another indication that the future requirements of this line, will be purchased in Japan. Another equitable arrangement which no one can object to as long as the railway debt to Japan remains unpaid.

We are able to reproduce with this article the photos and descriptions of the various new locomotives furnished the Chinese railways in the last two years.

Mikado Type (2-8-2) Locomotives for Manchurian Railways:

Sixty-five 2-8-2 type locomotives especially built for extreme winter conditions of North Manchuria have been supplied to the Chinese owned railways in Manchuria by the Skoda Works of Prague, Czechoslovakia. These locomotives which were originally built for freight traffic, have shown themselves adaptable for fast train hauling and also heavy freight trains. They are now being used by these railways as mixed-traffic locomotives.

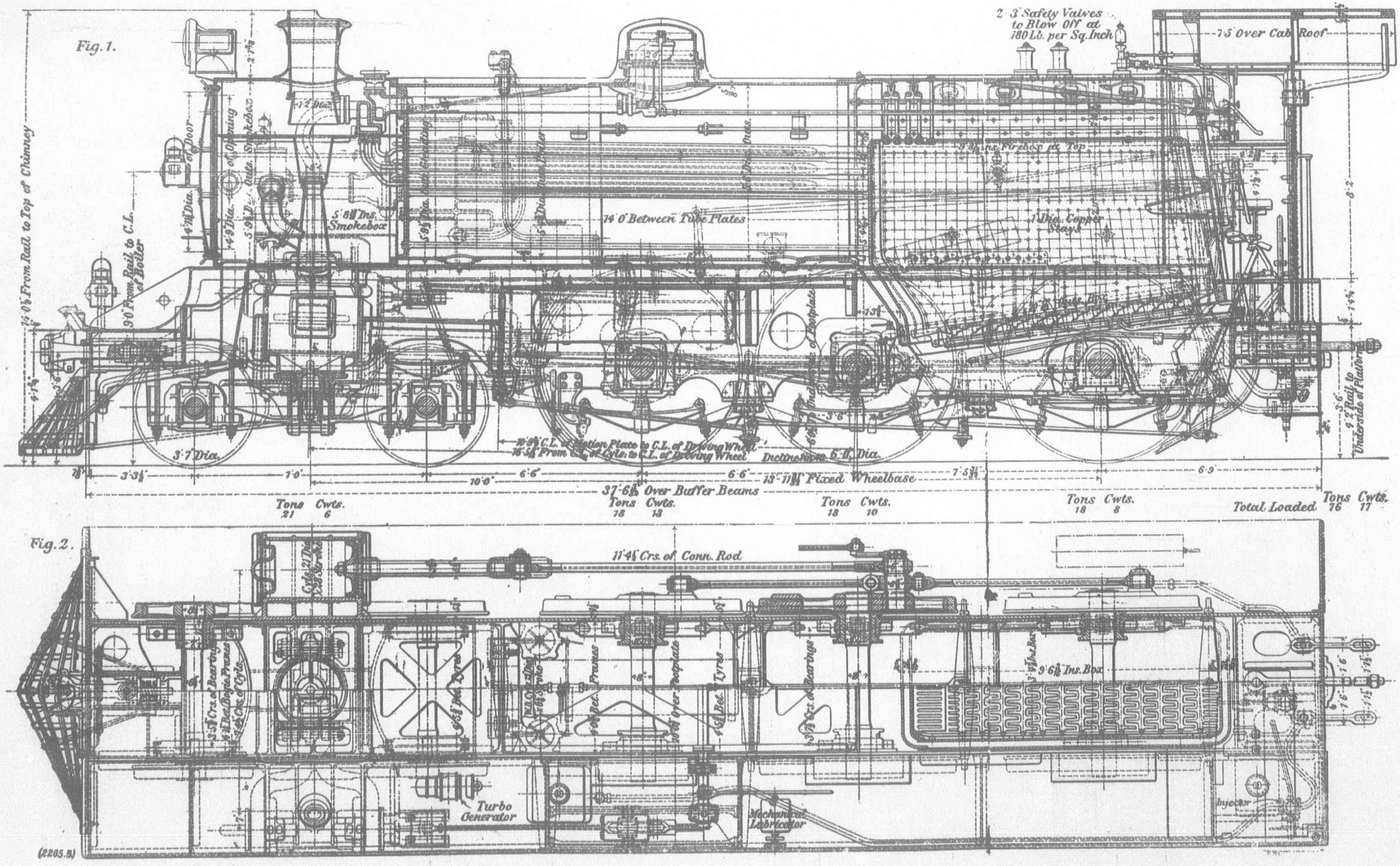
They are of standard gauge, with cast steel frames. The cylinders are 525 mm. dia. with a stroke of 710 mm working pressure 13 at. (191 lbs/sq. in.) At maximum boiler pressure the tractive effort amounts to 34,000 lbs. the factor of adhesion being 4.05. The valves are of the piston type, equipped with Heusinger-Walshaert gear. The diameters of the bogie wheels are 840 mm, of the driving wheels 1.400 mm and of the trailing wheels 1.000 mm. The driving wheelbase is 4.500 mm, the engine wheelbase 9.300 mm, the tender wheelbase 5 740, the total wheelbase 17.660 mm. The weight on the driving wheels in working order is 62.4 tons, while the total weight of the engine and tender is 135.5 tons.

The boiler is of the straight top type, telescopic, consisting of three rings, the inside diameter of the front ring being 1.600 mm. The firebox is 2.278 mm. × 1.580 mm. at grate surface. The total evaporative surface of the boiler amounts to 190.7 sq. meters out of which 172 sq. m. is taken by the tubes. Friedmann re-starting injectors and feed water heaters form a part of the equipment. The grate is of the rocking type.

Brakes of the Westinghouse type are fitted to these engines. Braking is applied to all driving wheels, the rigging being equalized. The same type of brake is fitted to the tenders.

The cylinders and valves are lubricated from the cab, by a pressure lubricator of the Friedmann Type R.

The tender has two bogies with wheels 1.000 mm. dia ; the bogie wheelbase is 1.840 mm, the total wheelbase is 5.740 mm, the total length of the tender is 7.340 mm, and the total length of



Sectional Elevation and Plan of the 4-6-0 Type Locomotive for the Government of Hongkong. (Reproduced from "Engineering")

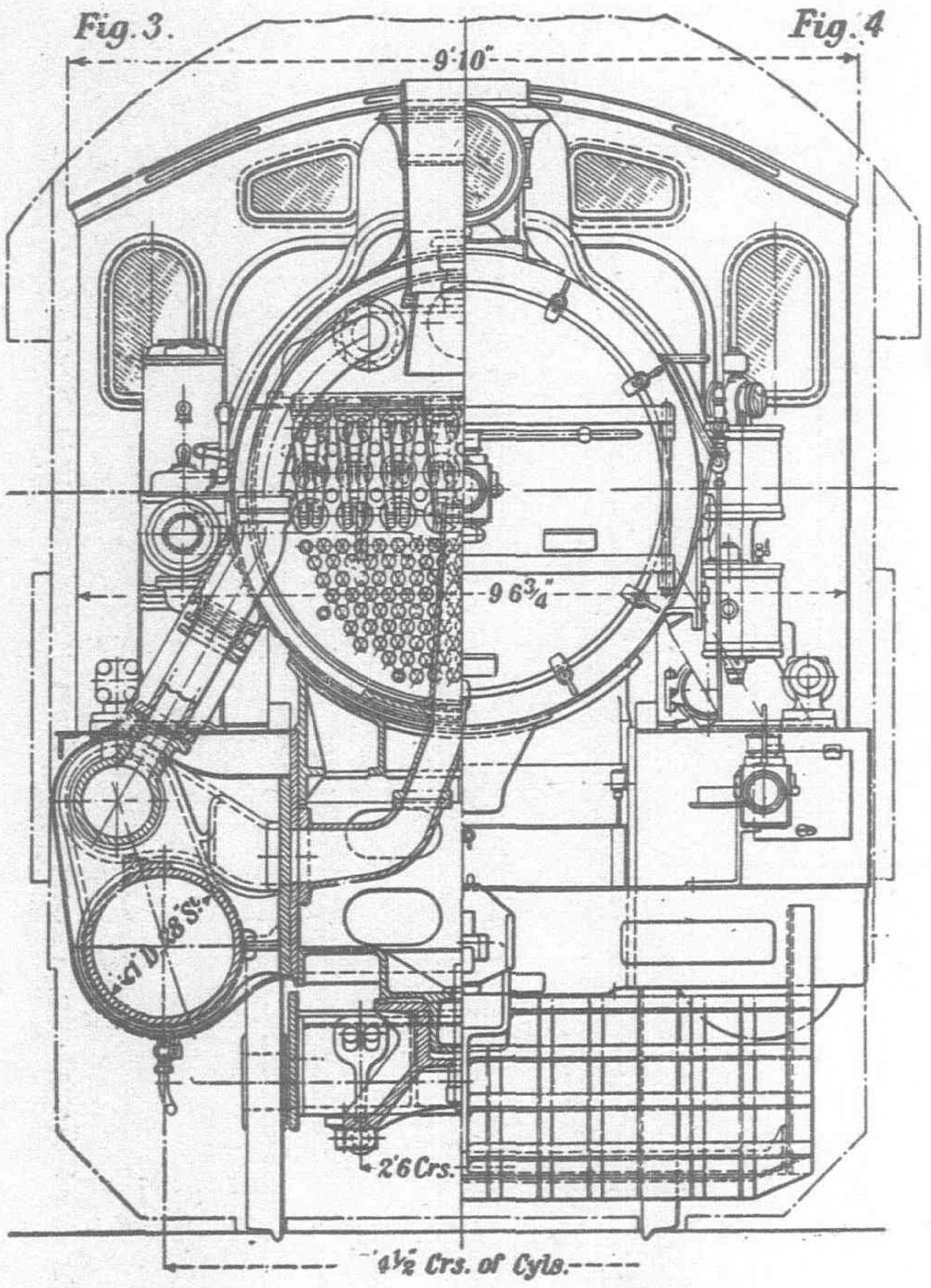


Fig. 3. Fig. 4

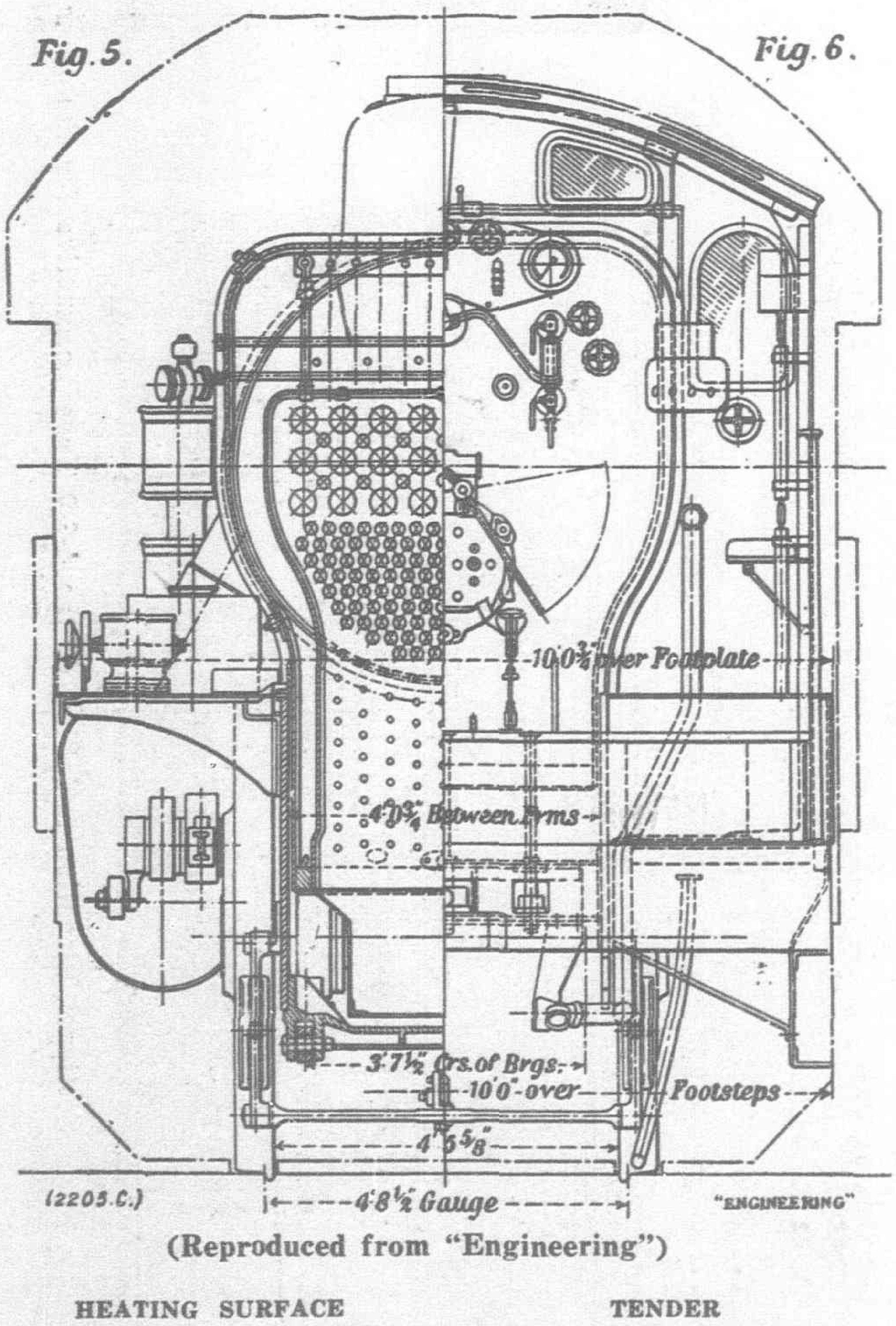


Fig. 5. Fig. 6.

(Reproduced from "Engineering")

HEATING SURFACE

	Sq. Ft.
Firebox	192.6
Tubes (136-2″ Outs. Dia.)	990.0
,, (24-5¼″ ,, ,,)	463.7
Total Evaporative	1646.3
Total	1976.3
Grate Area	32.0

TENDER

Water Capacity 6000 Galls.
Fuel ,, Coal 5 Tons

Cylinders 21″ Dia. × 28″ Stroke
Dia. Coupled Wheels 6′-0″
Boiler Pressure 180lb. per Sq. Inch

engine with tender is 20458 mm. The tender has a capacity of nine tons of coal and 5,000 gallons of water.

The locomotive is supplied with automatic pocket couplers, adjustable to the heights of couplers on freight cars, used by the various railways in northern Manchuria.

The usual engine equipment includes two headlights and cab-lighting with a Pyle National Generator Outfit.

4-6-0 TYPE LOCOMOTIVE FOR THE GOVERNMENT OF HONGKONG.

Messrs. Kitson & Company, Limited, Airedale Foundry, Leeds, have recently constructed three locomotives for through passenger service between Hongkong (Kowloon) and Canton. The engines were purchased by the Government of Hongkong on behalf of the Government of the Kwangtung Province. These are stated to be among the heaviest engines of their type in use in southern China, and are intended to work trains of 400 tons weight exclusive of engine and tender, at a speed on the level of 50 m.p.h. Gradients of 1 in 100 and 1 in 150 have to be traversed. The engines have been built to the order and under the supervision of the Crown Agents for the Colonies to the requirements of Mr. C. D. Lambert, Chief Mechanical Engineer.

The locomotives are standard gauge six coupled axles machines with 6-ft. diameter coupled wheels. The cylinders are 21-in. in diameter, with a stroke of 28-in. and the working pressure is 180 lbs. per square inch. At 90 per cent boiler pressure the tractive effort works out at 27,783 lbs., the factor of adhesion being 4-48. The valves, supplied through outside steam pipes, are of the piston type, 10-in. in diameter, driven by Walschaert gear, the maximum travel being 6 3/32-in. The valves have the following characteristics: 1½-in. steam lap; ⅛-in. lead; and no exhaust lap. Hendrie byepass valves are provided on the cylinders. The 6-ft. coupled wheels extend over a wheelbase of 13-ft. 11 31/32-in. The bogie, which has wheels 3-ft. 7-in. in diameter, has a wheelbase of 7-ft. The total wheelbase of the engine is 27-ft. 5 31/32-in. The weight on the coupled wheels in working order is 55 tons 11 cwts., and total weight of the engine under similar conditions 76 tons 17 cwts.

The boiler barrel is telescopic, of 5-ft. 6-in. outside diameter at the largest ring. The length between tube plates is 14-ft. The firebox and shell have a sloping back head, the throat sheet and bottom part of the firebox tube plate also sloping forward. The firebox is of the Belpaire type, 9-ft. 8 1/16-in. long at the top. The grate, between the frames, is sloping and 9-ft. 6 3/16-in. long, and with a width of 3-ft. 4⅜-in. provides an area of 32 sq. ft.

The evaporative heating surface is made up of 990 sq. ft. provided by 136 tubes 2-in. in outside diameter, and 24 5¼-in. tubes accommodating superheater elements and furnishing 463-7 sq. ft.; the firebox, of copper, provides 192-6 sq. ft. making a total of 1,646.3 sq. ft. The 24 superheater elements provide 330 sq. ft. of surface. The superheater is of the Superheater Company's pattern, with anti-vacuum valve. The equipment includes Clyde soot-blowers, a Worthington-Simpson 2 B vertical feed-water heater and pump, and a No. 10 Gresham under-footplate type injector. There are two 3-in. Ross safety valves. The grate is of the rocking type.

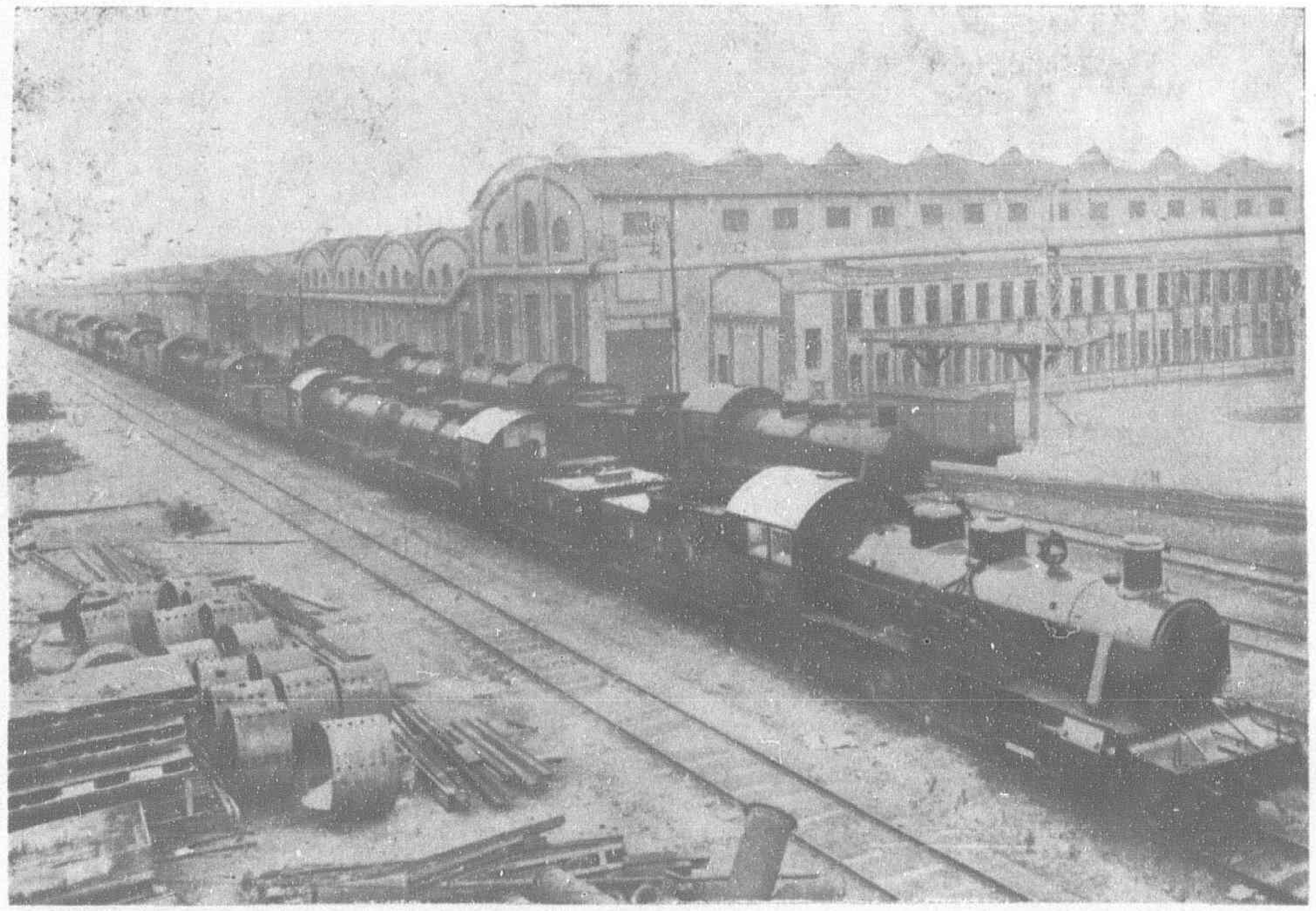
The bogie has 7½-in. total side play, the movement being under the control of three joint suspension hangers. Braking is applied to the coupled wheels, the rigging being equalized. It is operated by two Westinghouse cylinders inside the frames and in front of the leading coupled axle. The Westinghouse brake is also fitted to the tender, which also is supplied with the usual hand gear. Lubrication for the cylinders is supplied by a four-feed Detroit sight feed lubricator, while a 10-feed Wakefield machanical lubricator supplies the axle boxes of the coupled wheels and bogie. The sanding apparatus is of the Lambert wet sanding type. The engine is supplied with a Teloc speed indicator.

The tender has two bogies with wheels 3-ft. 7-in. in diameter. It has a capacity of 6,000 gallons of water and bunker space for five tons of coal. The bogie wheelbases are 6-ft., the total wheelbase being 17-ft. 9-in., and over all length 25-ft. 0⅜-in.

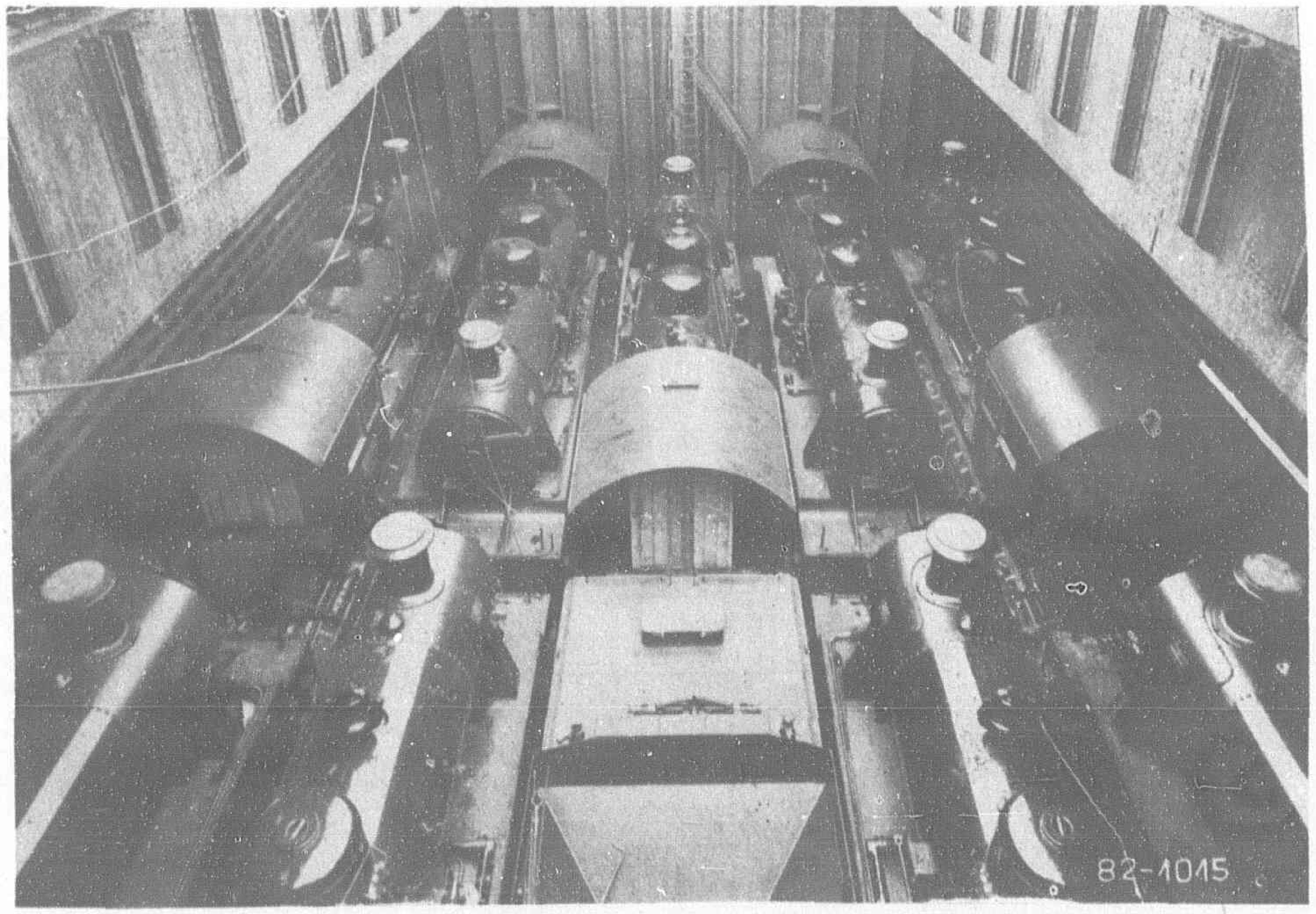
The locomotive is furnished with Majex couplers. The overall length of the engine and tender is 63-ft. 3¼-in. over buffer beams, and the total weight in working order 138 tons 14 cwt.

Other special equipment and fittings include the Worthington-Simpson "ZB" vertical type feed water heater and boiler feed pump and a No. 10 Gresham's patent underfoot plate type injector. The Westinghouse air system is employed for the brakes to all coupled wheels and the tender wheels, the latter are also fitted with a hand screw brake. "Stones" electric lighting, "Teloc" speed

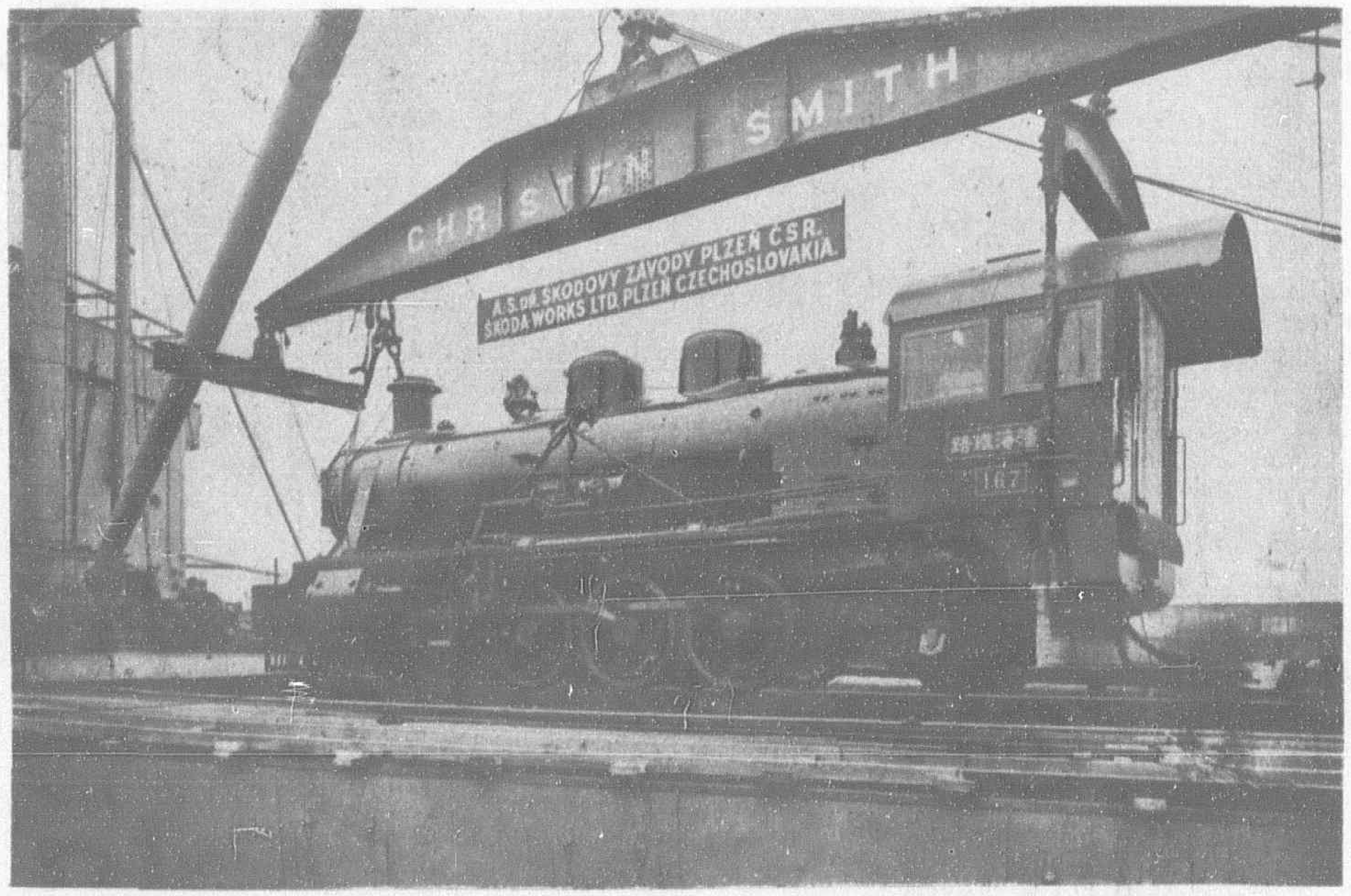
SHIPMENT OF 25 SKODA LOCOMOTITES FOR THE MUKDEN-HAILUNG RAILWAY



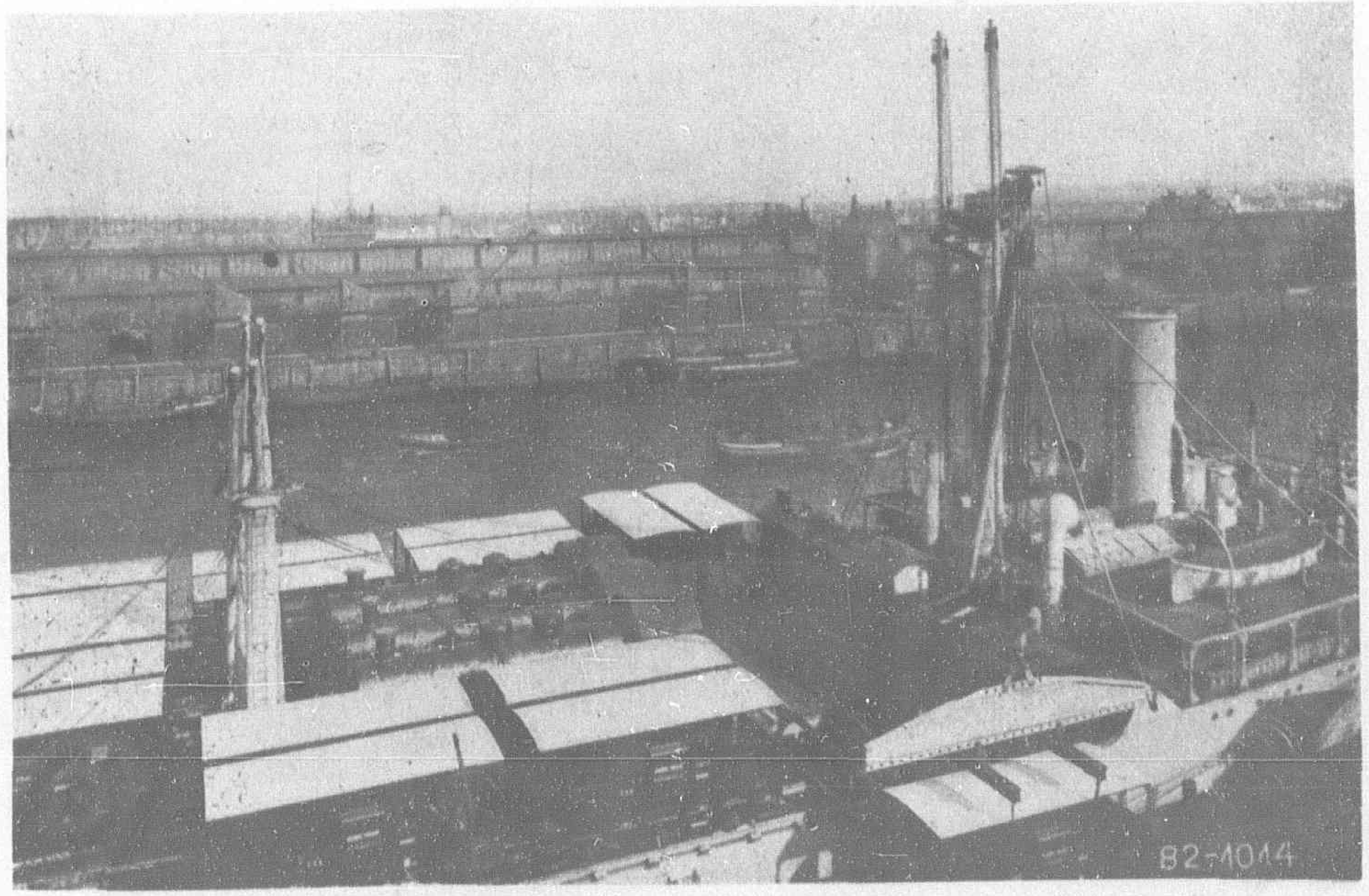
Completed order of 24 Locomotives, outside the shops of the Skoda Works in Prague, awaiting shipment



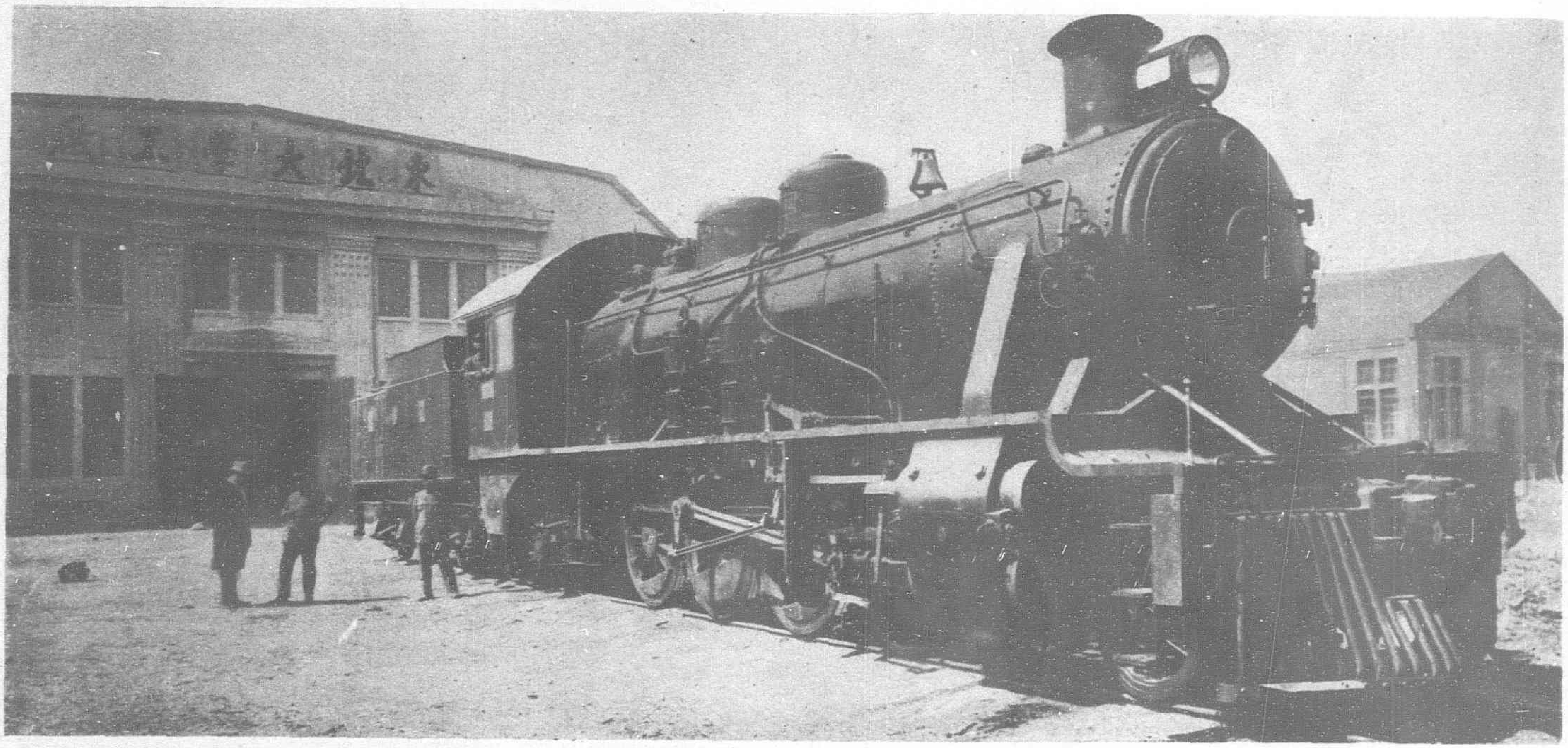
Showing Locomotives Stowed in Hold of Steamer


CHR.
SMITH
A.S. dř. SKODOVY ZAVODY PLZEŇ C.S.R.
ŠKODA WORKS LTD. PLZEŇ CZECHOSLOVAKIA.
瀋海鐵路
167

Lowering Complete Locomotive in Hold of Steamer at the Port of Hamburg

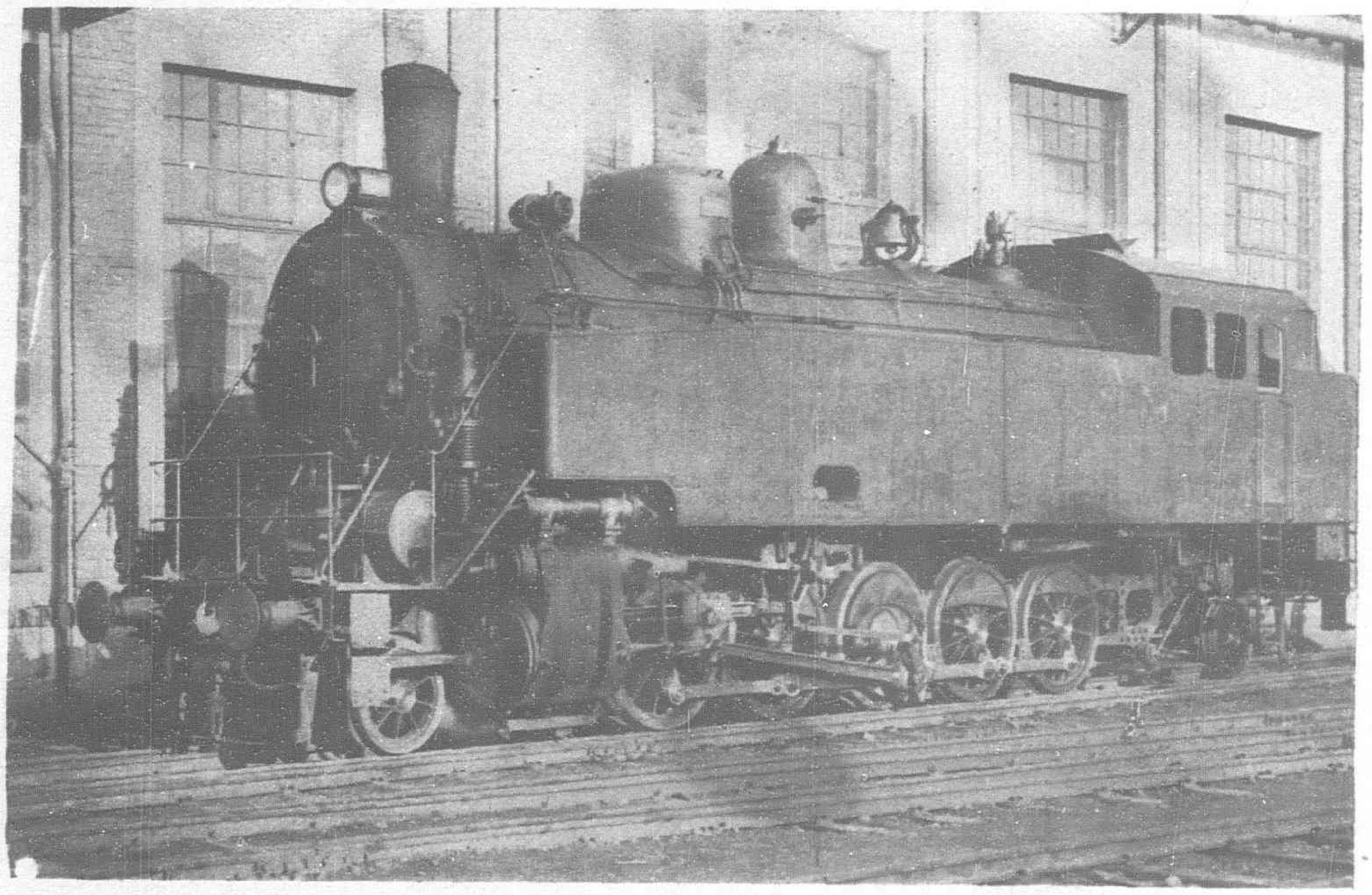


Deckload of Locomotives and Tenders



24 of these Mikado Type Locomotives for the Mukden-Hailung Railway were Supplied by the Skoda Works of Prague

indicator, "Franklin" air operated firedoor, "Ross" pop safety valves, "Hendrie" bye-pass valves, to the cylinders, "Majex" central couplers, Superheater Company's apparatus with anti-vacuum valves, and "Clyde" soot blowers. Two of the engines were fitted with "JOCO" type regulator while the third was fitted with the "Younghusband" type. The connecting and coupling rods are of "Vibrae" steel.

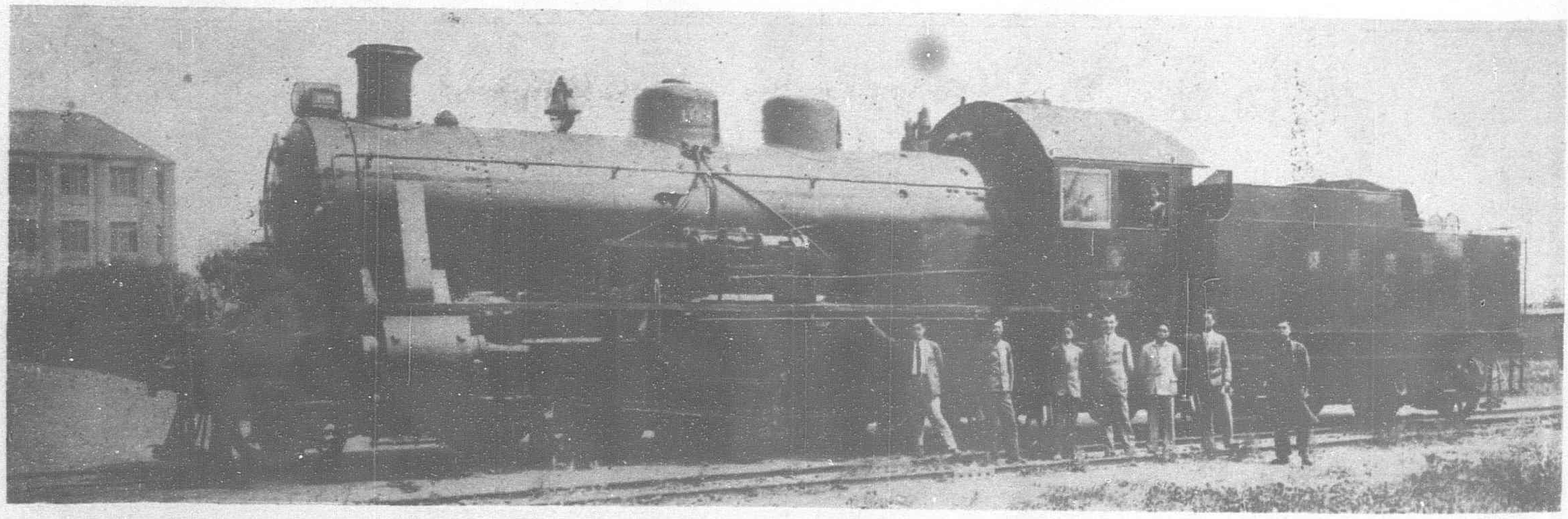


Heavy Tank Locomotive, 2-10-2 supplied by the Skoda Works, Ltd. to the Chinese Eastern Railway

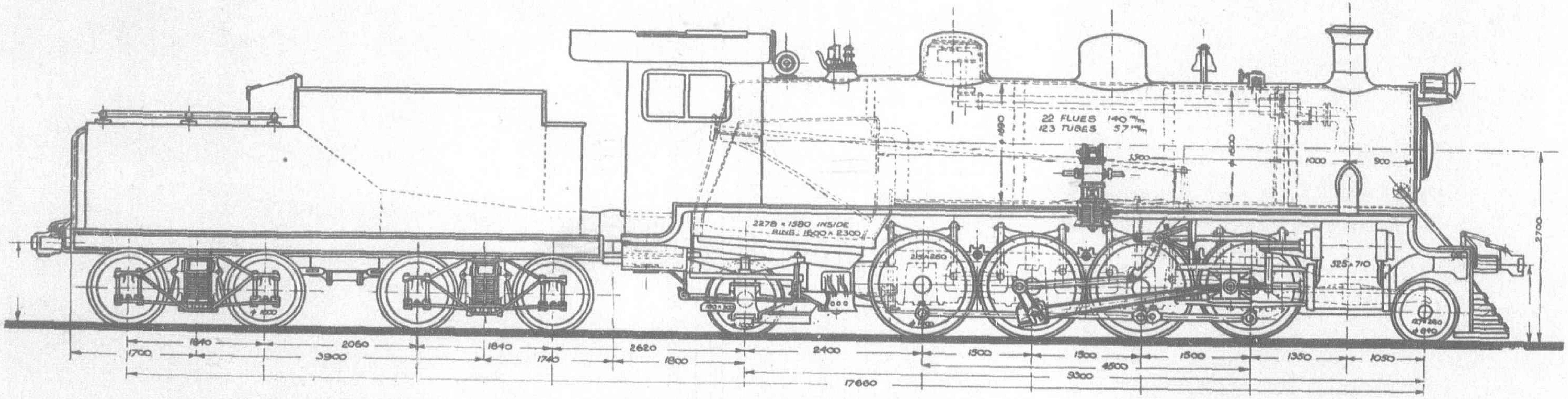
NEW 4-6-2 TYPE LOCOMOTIVES FOR THE NANKING-SHANGHAI RAILWAY

These engines are equipped with mechanical stoking apparatus and are introduced for fast passenger service, and, in addition, for heavy goods service at low speeds.

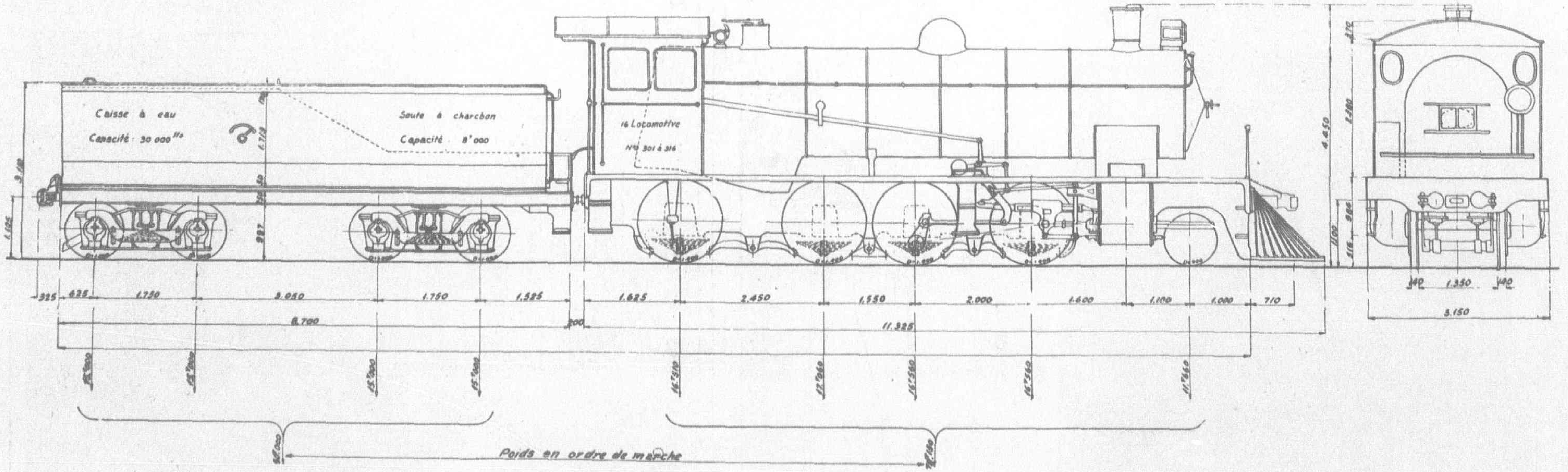
Eight 4–6–2 type locomotives equipped with double bogie tender carrying mechanical stoking mechanism have recently been completed to the order of the British and Chinese Corporation for the Nanking-Shanghai Railway by the North British Locomotive Co., Ltd, Glasgow. The engines, which have been designed and constructed in accordance with the



24 of these 2-8-2, Two cylinder, superheated Standard guage Locomotives were supplied to the Tsitsihar-Koshan Railway by the Skoda Works of Prague. Steam pressure, 185 lbs. Total heating surface, 2059 sq. ft.: Total weight in working order 75 Tons: Weight of Tender in working order, 51.25 Tons: Maximum speed 43.5 m.p.h.

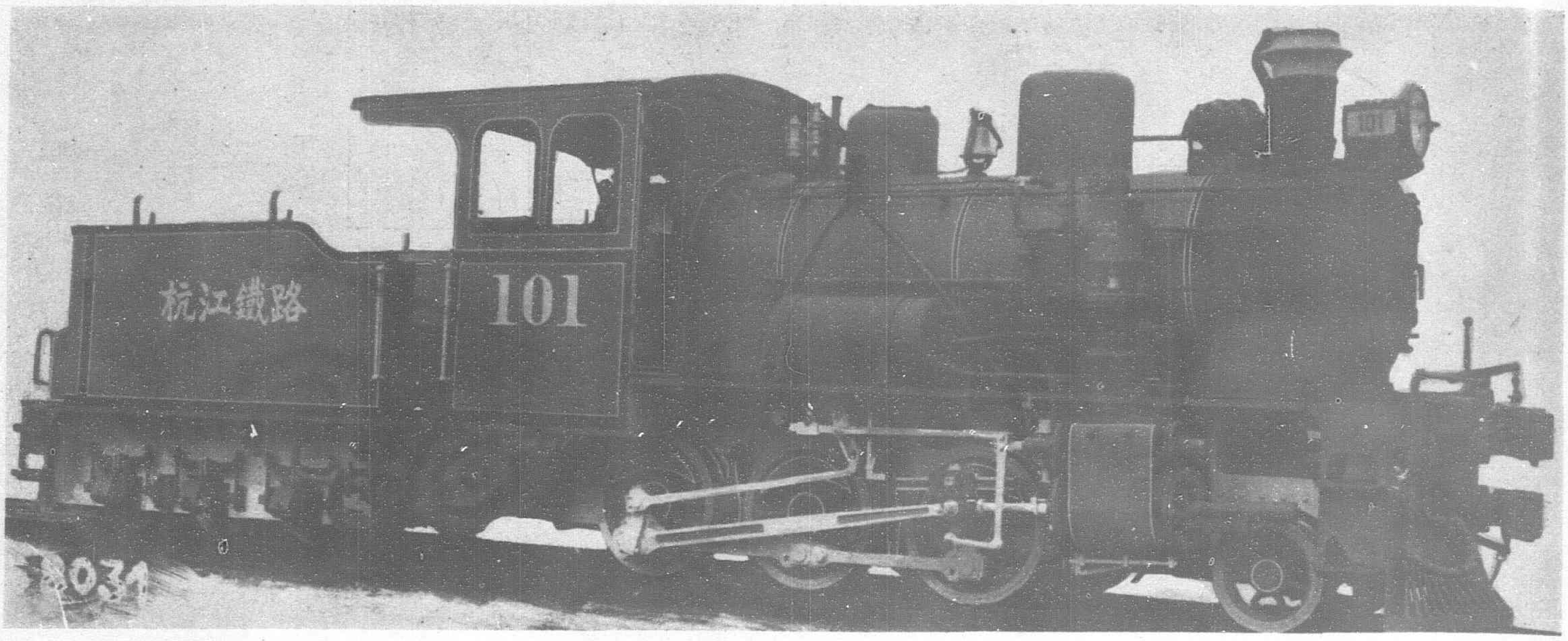


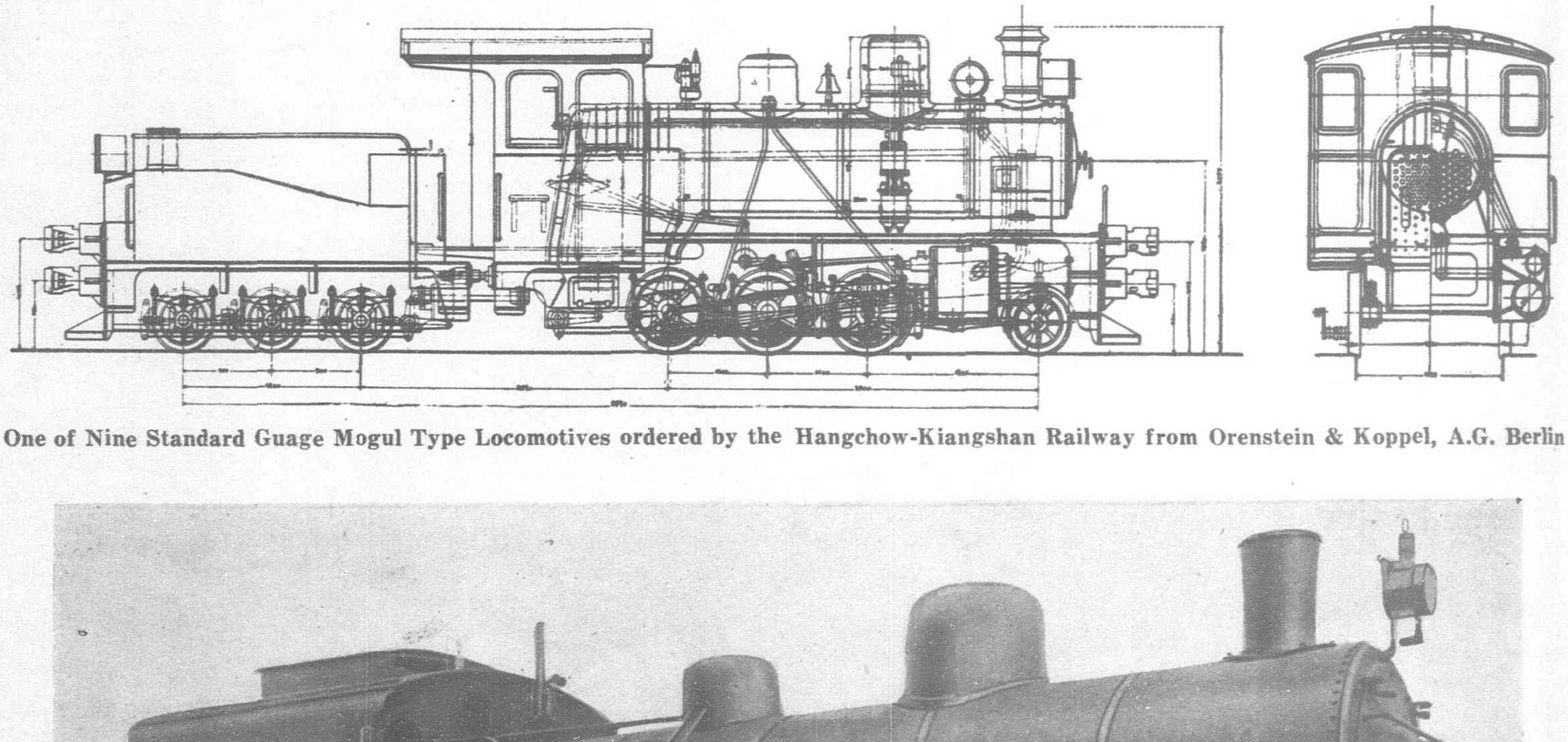
Mikado, 2-8-2, two Cylinder Locomotive supplied by the Skoda Works, Ltd. to Chinese Government Railways in Manchuria



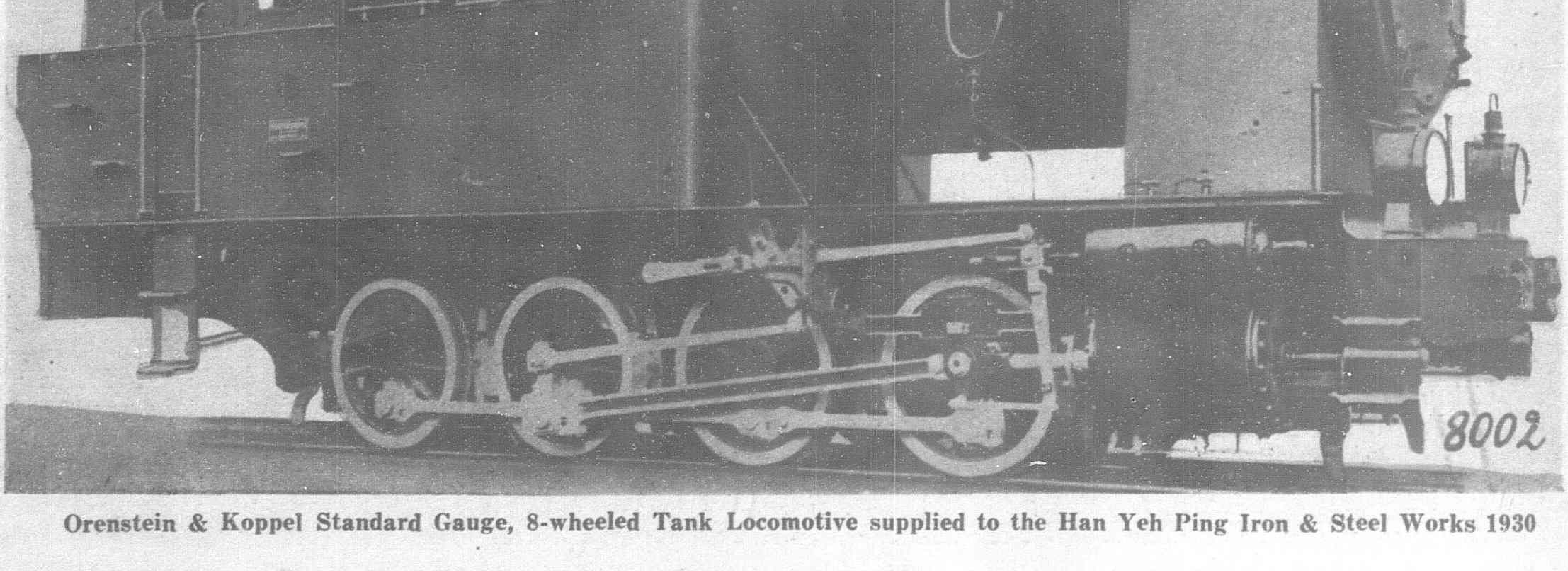
2-8-0 Consolidation Type Belgian Locomotive for the Lung-Hai Railway, Makers, Les Ateliers Metallurgiques de Tubize

RECENT GERMAN LOCOMOTIVES FOR CHINESE RAILWAYS

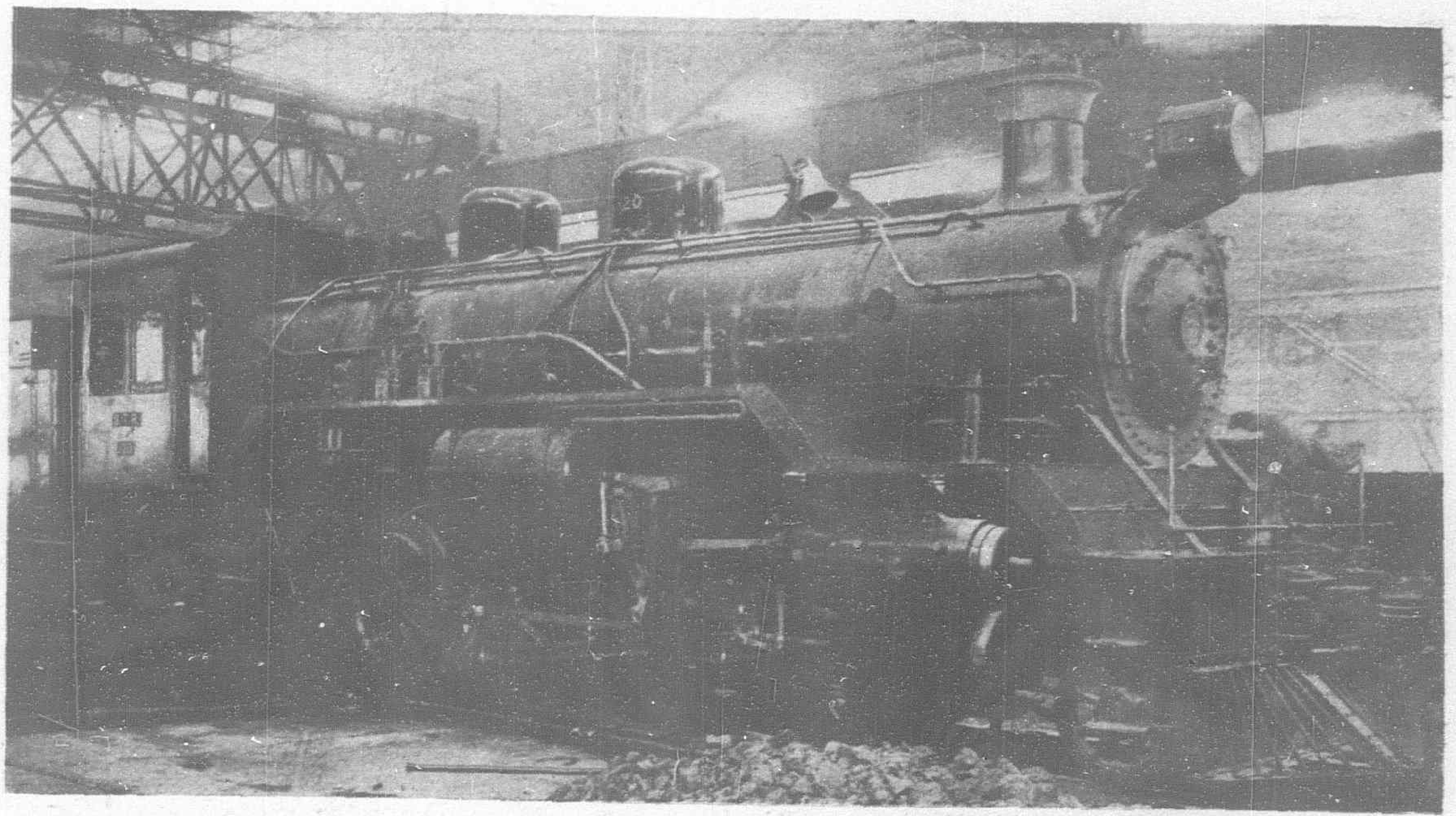




One of Nine Standard Guage Mogul Type Locomotives ordered by the Hangchow-Kiangshan Railway from Orenstein & Koppel, A.G. Berlin



Orenstein & Koppel Standard Gauge, 8-wheeled Tank Locomotive supplied to the Han Yeh Ping Iron & Steel Works 1930



Mikado Type 2-8-2 Belgian Locomotive (Baume-Marpent, Liege) Supplied to the Ssupingkai-Taonan Railway by Arnhold & Co., Ltd.

specifications of Messrs. A. J. Barry, C.B.E., K. A. Wolfe Barry, O.B.E., and L. Lumsden Rae, the consulting engineers to the Nanking-Shanghai Railway, and to their inspection, are being introduced for working fast passenger trains and, in addition, heavy freight trains at low speeds, thus ranking them as mixed-traffic locomotives with distinctive characteristics.

These engines have two single-expansion cylinders placed outside the frames and driving the middle pair of coupled wheels. The piston valve steam chests are placed above them, the valves being actuated by Walschaerts gear. The boiler is fitted with a wide firebox and has the ample grate area of 50.3 sq. ft. The equipment of the locomotive, of which details are given later, is of a complete description, the most noteworthy feature being the mechanical stoking device, which is of the Du Pont Simplex underside feeder type. Details of this are shown in one of the accompanying drawings, and the general layout of the mechanism is also seen in the sectional drawing of the tender as a whole.

Coal from the bunker falls into the stoker conveyor on the tender, a crusher plate lying under the coal gap. The conveyor projector and screws extend forward to the underside of the firebox and to a vertical projector, from which the coal is delivered in the firebox just below the level of the fire door, from whence it is distributed by steam jets over the grate. Surrounding the vertical projector is a protection grating, which also allows an air current from the ashpan to pass upwards. Control of the amount of coal is effected in two ways, first by the sliding plates over the gap and at the bottom of the bunker, and secondly, by regulating the speed of the conveyor screw which is actuated by a steam engine. This latter is of the two-cylinder horizontal type, its speed being controlled by the throttle valve.

The driving shaft and the internal conveyor screw are fitted with universal couplings and the conveyor housing is fitted with ball joints to allow of the necessary flexibility between the engine and tender. The conveyor housing between the ball joints forms a heavy coupling, which allows for the detachment of the tender from the engine. It may further be noted that when detached the stoker may be used to unload the coal on the tender, it only being necessary for this purpose that a steam or air pressure connection should be available.

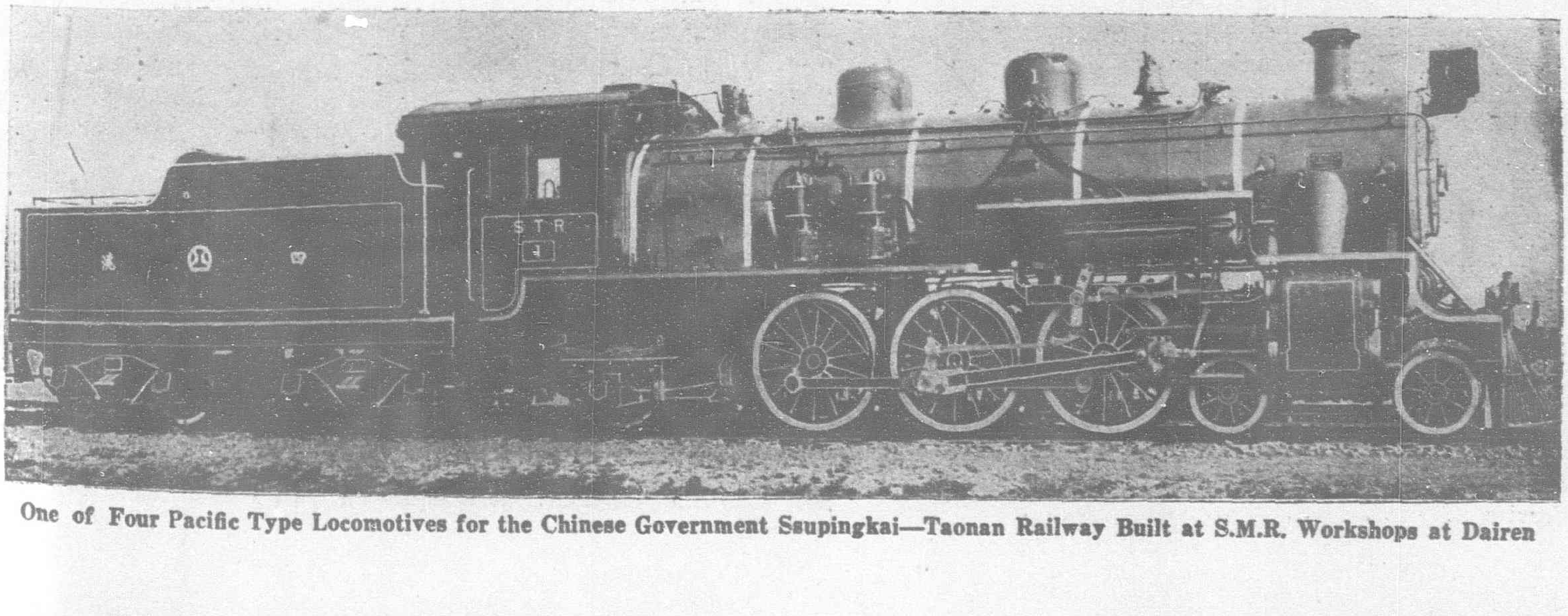
The equipment of the engine includes the following fittings :—Boiler top feed—Holden & Brookes injector—Weir pump and feed heater—Detroit sight feed lubricator—Ross Pop safety valves—superheater with multiple valve regulator and a set of 22 elements manufactured by the Superheater Co., Ltd.—The Westinghouse Brake & Saxby Signal Company's carriage heating valves, etc.—Lambert sanding valves—Westinghouse automatic and non-automatic brake—electric head-light and cab lighting (Stone's system).

The arrangement of the cab interior and fittings is clearly shown in the photographic illustration reproduced below—and we also give an illustration of the front of the tender showing the location of the conveyor screw.

DETAILS OF MECHANICAL STOKER WITH ENGINE AND TENDER CONNECTIONS

The main particulars of the locomotive are as follows :—

Cylinders, diam.	20½-in.
,, stroke	26-in.
Wheels, front bogie, diam.	3-ft. 0-in.
,, coupled, diam.	5-ft. 3-in.
,, hind radial, daim.	3-ft. 6-in.
Wheelbase, rigid	11-ft. 6-in.
,, total	33-ft. 9-in.
Working pressure	200 lbs. per sq. in.
Boiler heating surface tubes	1,424 sq. ft.
Brick arch tubes	24 ,, ,,
Fire-box	210 ,, ,,
Total	1,658 sq. ft.
Superheater	400 ,, ,,
Combined total	2,058 sq. ft.

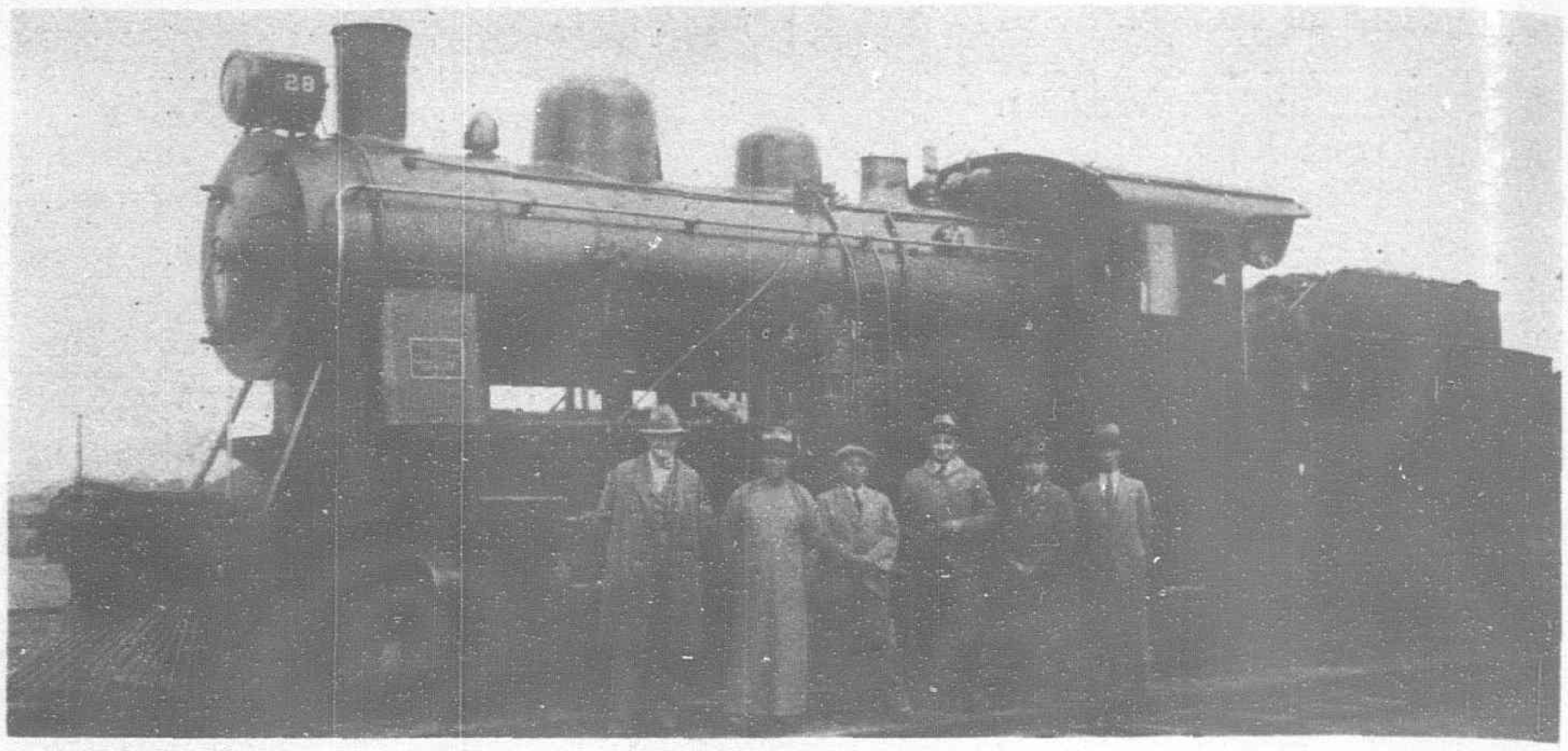


One of Four Pacific Type Locomotives for the Chinese Government Ssupingkai—Taonan Railway Built at S.M.R. Workshops at Dairen

Grate area	50.3 sq. ft.
Tractive force at 75 per cent of boiler pressure	26,000 lbs.
Tractive force at 85 per cent of boiler pressure ..	29,480 lbs.
Weight in working order ..	90 tons 16 cwt.
Weight on coupled wheels ..	54 tons.
Tender :—	
Wheels, diam.	3-ft. 6-in.
Wheelbase	20-ft. 6-in.
Tank capacity, ...	6,000 gallons.
Fuel space (12 tons) ..	540 cub. ft.
Weight, full	71 tons.
Wheelbase, total engine and tender	63-ft.

The Nanking-Shanghai Railway is laid on the 4-ft. 8½-in. gauge, with 85 lbs. per yard flat-bottomed rails and operates over a mileage of 200. The alignment is easy, the maximum curve being 20 chains, and the maximum gradient 1 in 180 for a short distance. The locomotives are capable of traversing in the sidings 1 in 6 crossings with 12-ft. points.

The Engineer-in-Chief and the Locomotive Superintendent are Mr. I. Tuxford and Mr. Geo. T. Finch, respectively.



One of two 2-8-0 Schwartzkoff locomotives Supplied to the Canton-Samshui Railway

BELGIAN LOCOMOTIVES FOR CHINA

On page 13 will be found a drawing of the Consolidated 2-8-0 Belgian locomotives for the Lung-Hai and Shanghai-Nanking lines. Sixteen locomotives of this type were delivered to the Lung-Hai line in 1924 through the Societe Belge de Chemins de Fer en Chine. Since then as noted above, six additional engines of this type were supplied to the Lung-Hai line in 1929, and eight to the Nanking-Shanghai line. All of these locomotives were built at Les Ateliers Metallurgique de Tubize in Belgium and the last fourteen delivered in 1929, 30 were paid for by the remitted Belgian Boxer Indemnity funds. The specifications for these engines follows :

LOCOMOTIVES CONSOLIDATION SIMPLE EXPANSION—SPECIFICATIONS

Grate	length		2.400	m.
	width		1.500	,,
	surface		3.60	m^2
Heating surface	furnace		13.20	,,
	tubes		166.80	,,
	total		180.00	,,
Tubes	quantity	small	218	
		large	24	
	diameter	small	40/45	m/m
		large	118/127	,,
Outside heating surface			45.00	m^2
Capacity of boiler	water		6.600	m^3
	steam		3.400	,,
	Total		10.000	,,
Diameter of cylinders MP.			0.600	m.
Course of pistons			0.660	,,
Diameter of wheels	motrice		1.400	,,
	supporting		0.900	,,
	of tender		1.000	,,
Weight of Loco. empty			70.350	T.
,, ,, ,, in running order			78.150	,,
Adhesing weight of machine			66.480	,,
Effort of traction			12.550	,,
Power in hp.			1.300	hp.
Weight of tender empty			22.000	T.
,, ,, ,, loaded			60.000	,,
Capacity of water tanks			30.000	,,
,, in coal			8.000	,,

BELGIAN LOCOMOTIVES FOR MANCHURIA

In addition to the locomotives supplied to the Lung-Hai and Nanking-Shanghai lines, four Mikado type engines built by Liege have been supplied to the Chinese Government Ssupingkai-Taonan Railway in Manchuria by Messrs. Arnhold & Company. The specifications of these engines follows :

Gauge of track	1435 m/m (4′ 8½″)
Service	freight
Diameter of cylinder	520 m/m.
Piston stroke	710 ,,
Diameter of driving wheel	1400 ,,
Diameter of truck wheel (leading)	840 ,,
Diameter of truck wheel (trailing)	1000 ,,
Inside diameter of boiler at smallest course	1600 ,,
Steam pressure	13 kg./sq. c.m.
Length of fire box at grate surface	2278 m/m.
Width of fire box at grate surface	1580 ,,
Number of tubes	123.
Diameter of tubes	57 ,,
Number of flues	22.
Diameter of flues	140 ,,
Length of tubes and flues	5500 ,,
Number of arch tubes	4.
Diameter of arch tubes	76 ,,
Driving wheel base	4500 ,,
Engine wheel base	9300 ,,
Engine and tender wheel bases	17660 ,,
Width of engine	3150 ,,
Height of boiler center line above rail ...	2700 ,,
Approx. weight in working order :—	
Leading wheels	7000 kg.
Driving wheels	62400 ,,
Trailing wheels	13600 ,,
Engine	83000 ,,
Tender	52500 ,,
Weight empty (engine)	73000 ,,
Weight empty (tender)	21000 ,,
Kind of fuel	soft coal.
Heating surface :—	
Tubes and flues	172 sq. n.
Fire box	17 ,,
Arch tube	1.7 ,,
Total	190.7 ,,
Super heating surface	44 ,,
Grate area	3.6 ,,
Grate	1 in 130
Minimum radius of curve	500 m.
Water in tender	22½ cub. m. (5950 USG.)
Coal in tender	9 tons (metric)
Tractive force	14900 kg.
Factor of adhesion	4.06

GERMAN LOCOMOTIVES FOR CHINA

The most recent orders from China placed in Germany for locomotives, have gone to Orenstein & Koppel, A.G. of Berlin, who have a long record of sales in the Far East having supplied to date over one thousand engines for various railways from Japan to Java. The latest order is for nine Mogul type engines for the Hangchow-Kiangshan Railway in Chekiang, a private Chinese enterprise. The O. & K. engines ordered are of special interest for new railways in this country, having a service weight of 37 tons for standard gauge track of very light rails, which in this instance are 35 lbs. The locomotive develops 160-180 h.p. and a speed of 40 km. per hour. It is equipped with Westinghouse air brakes, electric lighting and arched brick fire-box. The following are the main dimensions of the engine:

Tender

Diameter of wheels	600 m/m.
Wheel base	1800 ,,
Water capacity	5000 L
Fuel capacity	2500 ,,
Weight empty	CA 7, 0 T
Weight in working order	CA 14, 0 T

Locomotive

Gauge of track	1435 m/m.
Diameter of cylinders	310 ,,
Stroke of pistons	450 ,,
Diameter of driving wheels	900 ,,
Diameter of bogie wheels	600 ,,
Wheel base rigid	2200 ,,
Total	3900 ,,
Working pressure	12 atm
Heating surface total	43, 7 m²
Grate area	0.9 ,,
Weight empty	CA 20, 2T
Weight in working order	22, 0 ,,
Weight in working order, driving ...	19, 0 ,,
Tractive power (0.6)	3460 kg.

Messrs. Orenstein & Koppel also supplied last year an eight-wheeled tank engine for the Han Yeh Ping Iron & Steel Works for service in their mines.

In addition to the above, the Canton branch of Messrs. Reuter, Brockelman & Company, supplied in 1929, two Schwartzkopf 2-8-0 locomotives for the Canton-Shamsui Railway, one 2-6-2 Henschel locomotive for the Swatow-Chaochowfu Railway, and two locomotive boilers for the Canton-Kowloon line.

We are informed by the management of the Far Eastern Agencies of the (Ceskomoravska-Kolben-Danek) C.K.D. Works of Prague, Czechoslvakia, that three of their 2-8-2 locomotives have been supplied to railways in North China during the past two years. The illustration on page 18 shows these locomotives which are fitted with Lentz valve gear.

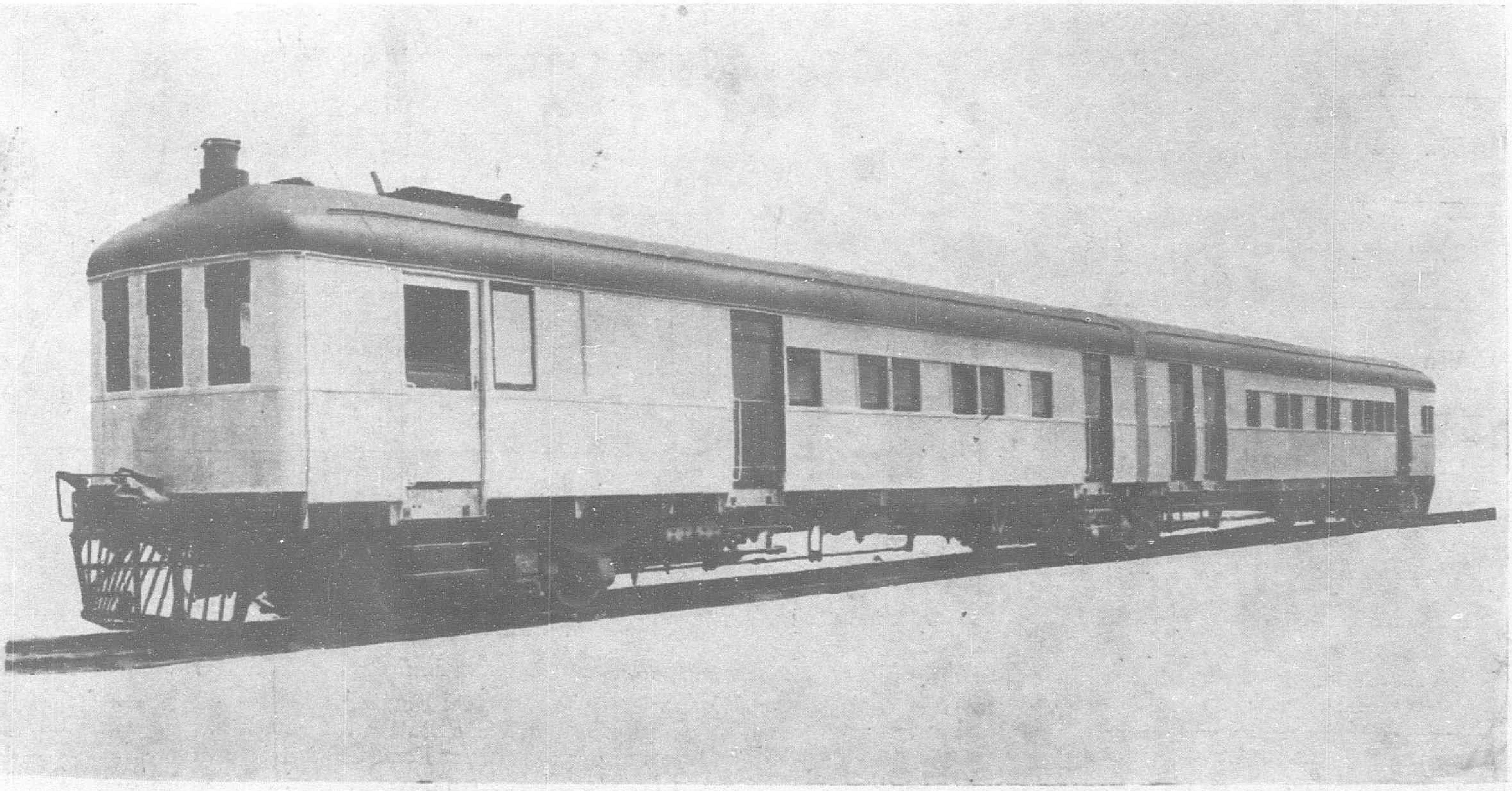
Sentinel-Cammel Steam Rail Cars

For the Nanking-Shanghai Railway

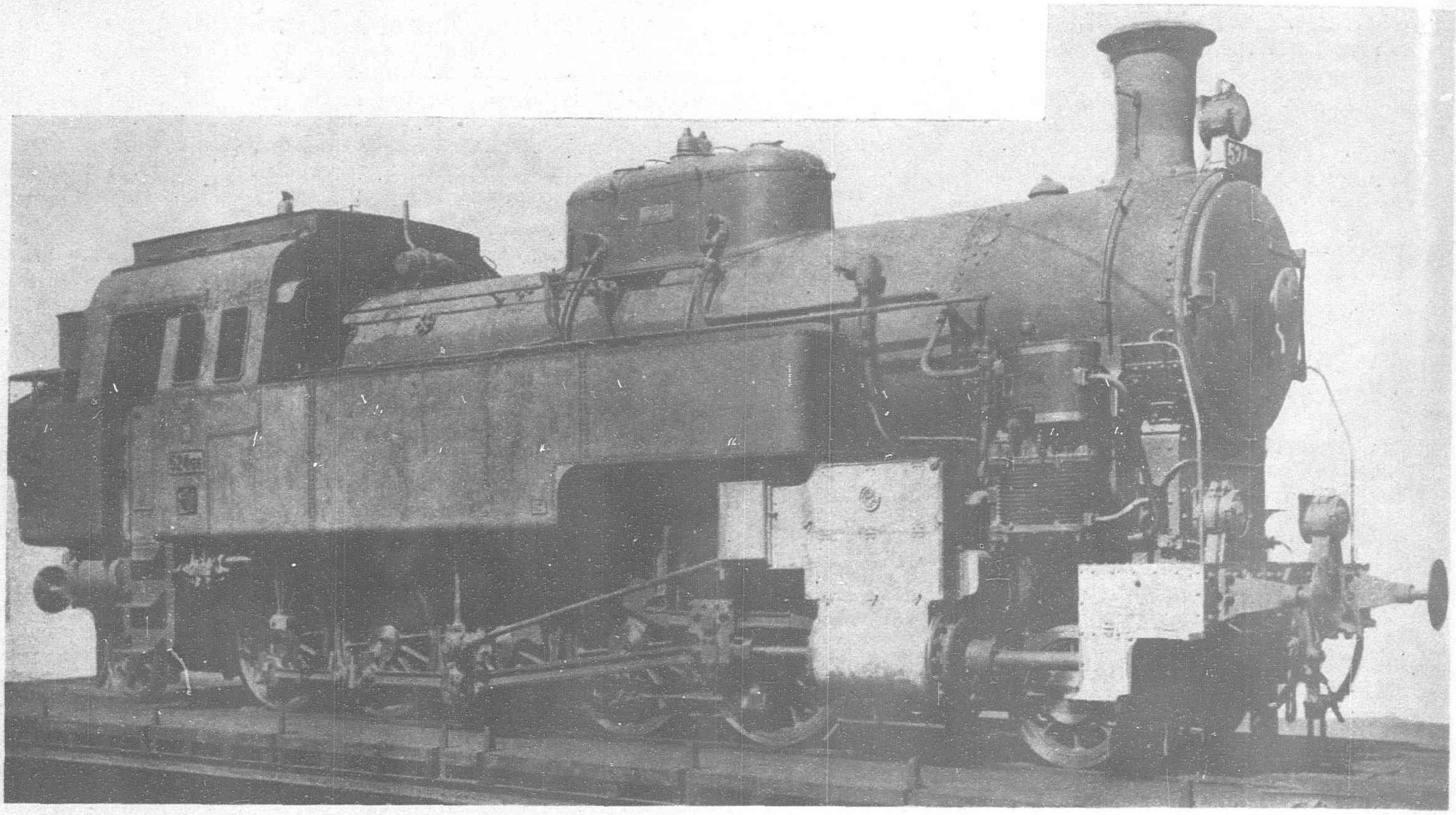
In December 1928, the Shanghai-Nanking Railway ordered twelve Sentinel-Cammel Steam Rail Cars, for its interurban service between Shanghai and Woosung Forts. Their delivery was completed in November 1929, and were placed in service in March 1930.

These steam cars represent one of the most modern, efficient and economical means of carrying passengers on railways. The manufactureres claim that no other type or make of railcar can be operated at such a low cost, and point to the fact that they are now running in 44 different countries. Asiatic railways operating these cars include those in Borneo, Ceylon, China, India, Iraq, Korea and the Malay States. These cars are steam driven using the coal of the country as fuel and have no complicated machinery which require special training or knowledge to handle. Those of the latest type running on six pairs of wheels and fitted with twin bodies carry 150 passengers. The total weight of the car complete with passengers, luggage, engine, boiler, water tanks and coal is only 57 tons, and consumes only 17 lbs of coal per mile, and about 1/20 of one pint of lubricating oil per mile. The engines of the car are of 107 h.p. They are fitted with Westinghouse air brakes, electric light and steam heating. The saving of money which resulted from the purchase of these five sets of Sentinel-Cammell steam railcars and the benefits which the railway was enabled to offer to its passengers by the reduction of fares is well illustrated by the following official figures compiled by the Railway Authorities.

		Number of passengers carried	*Amount collected in fares*
April 1929,	with trains drawn by ordinary steam locomotives and with fares charged at ordinary rates as per Table "A"	105,554	$15,835.35
April 1930,	with Sentinel - Cammell steam railcars and with reduced fares charged as per Table " B "	209,474	$30,715.6



Sentinel-Cammel Steam Rail Cars in Operation on the Shanghai-Nanking Railway



2-8-2 C.K.D. Works Locomotive supplied to railways in China

The railway therefore carried one hundred and three thousand nine hundred and twenty-one more passengers in the Sentinel-Cammel steam railcars in the one month and earned fourteen thousand eight hundred and eighty dollars.

Nanking-Shanghai Railway

Passengers Fares—Table of rates charged *before the Sentinel-Cammell steam rail cars were put into service* on the Shanghai-Woosung Line.

TABLE "A."

STATIONS.

Shanghai North						
Tientungan	20 10 05					
Kiangwan	40 20 10	20 10 05				
Changwarpang	80 40 20	60 30 15	40 20 10			
Wantsaopang	80 40 20	60 30 15	40 20 10	20 10 05		
Woosuntseng	80 40 20	60 30 15	60 30 15	20 10 05	20 10 05	
Woosung Forts.	1.00 50 25	80 40 20	60 30 15	20 10 05	20 10 05	20 10 05

Passengers Fares—Table of rates charged *as soon as the Sentinel-Cammel steam rail cars were put into service* on the Shanghai-Woosung Line.

TABLE "B."

STATIONS							
Shanghai North							
Tientungan	10 05						
Kiangwan	25 10	15 05					
Kaokingmiao	30 10	25 10	10 05				
Changwarpang	45 15	40 15	25 10	15 05			
Wantsaopang	50 20	45 15	30 10	20 10	10 05		
Woosungtseng	55 20	45 15	35 15	25 10	15 05	10 05	
Woosung Furts	55 20	55 20	40 15	30 10	15 05	15 05	10 05

The manufacturers claims for economy in cost of running are substantiated by the following figures compiled officially by the Nanking-Shanghai railway authorities.

Sentinel-Cammell Steam Rail Car No. 275, April, 15, 1930.

Departed from Shanghai North Station	7.30 a.m.
Arrived Woosung Forts Station,.	8.12 a.m.
Departed from Woosung Forts Station	8.29 a.m.
Arrived Shanghai North Station, ...	9.10 a.m.
Departed from Shanghai North Station	9.24 a.m.

Arrived Woosung Forts Station . ... 10.03 a.m.
Departed from Woosung Forts Station ... ... 10.13 a.m.
Arrived Shanghai North Station. ... ... 10.50 a.m.
Twenty-eight stops at Stations for two return trips 80½ minutes
Total standing time at Stations for two return trips
Total coal consumed for two return trips 657 lbs ; — 298 kgs.
Total distance two return trips — 40 miles — 63.48 kms.
Standing time at Stations 80 ½ minutes=40 lbs. coal per hour — 53 lbs — 24.04 kgs.
Overall coal consumption 657 lbs — 40 — lt lbs per mile — 4.69 kgs. per km.
Actual coal consumption for running 604 lbs — 40 — 15 lbs.
Per mile — 4.32 kgs. per km.

North China Market for Railway Materials

U.S. Assistant Trade Commissioner Louis C. Venator, in a recent report to the Department of Commerce says that though the railways of North China made no purchases of rolling stock during 1930, dealers in railway materials report that business in general was fairly good—particularly in so far as the Peking-Mukden (Peiping-Liaoning) Railway is concerned. Imports of railway materials into Tientsin during 1930 were valued at 1,500,000 taels (about $388,450), as compared with approximately 500,000 taels ($196,150) during 1929. Although some of this business was closed during the latter part of 1929, the figure may be considered none too large to represent 1930 transactions, as reports from unofficial but well-informed sources indicate that purchases valued at more than 500,000 taels were made by the Peking-Mukden Railway during November and early December. This material, which includes metals for use in the railway shops at Tongshan, rods, small replacement parts, car furnishing, etc., will not arrive, of course, until 1931.

The condition of rolling stock on the Peking-Suiyuan Railway was extremely bad during the entire year. Both cars and locomotives were short in number, owing to the commandeering of military authorities, and those that remained in service were in need of repairs, but because of the lack of profitable operations throughout the year, no money was available either for purchases or repairs.

Purchases Additional Rolling Stock Planned

The Peking-Mukden Railway, on the contrary, was in better condition as regards rolling stock than at any time in the past few years, the cars and locomotives previously taken by military authorities into Manchuria and central China having been largely returned.

However, the equipment is still below requirements for operating schedules such as are planned for the near future and purchases are contemplated when and if money becomes available. At present, negotiations are under way for 20 locomotives and a considerable amount of shop and other equipment. The locomotives, it is understood, are to be purchased on a semi-credit or bank-guarantee basis, if manufacturers will agree. Purchases of other rolling stock are planned at a more remote date.

The Kailan Mining Administration, one of the largest customers of the Peking-Mukden Railway, closed the purchase of six locomotives from a British manufacturer during December. These locomotives are to be used mainly in operating Kailan trains, but will also be utilized in other ways.

The Peking-Mukden Railway would have had a favorable year and large revenues during 1930 had it not been for severe washouts which occurred at several points along the line during the late summer, and for the several weeks when traffic was entirely interrupted by the transportation of troops from Mukden to Tientsin. Operations during the other months of the year indicated a yearly revenue in the neighborhood of 30,000,000 Mexican dollars (about $8,538,000), but with these interruptions and the resulting loss in equipment and repairs it is probable that the total revenues will amount to less than three-quarters of this amount. Since a large portion of this amount must go to the Mukden Government, it is apparent that but a limited sum remains over and above operating expenses for the purchase of new equipment.

Prospects More Favorable for 1931

Prospects for railway business during 1931 appear promising. The managing director of the Peking-Mukden Railway is inaugurating a number of new principles intended to increase traffic in various ways and, with military traffic now reduced to a minimum, revenues of the railway will probably show a worthwhile increase as long as peaceful conditions obtain.

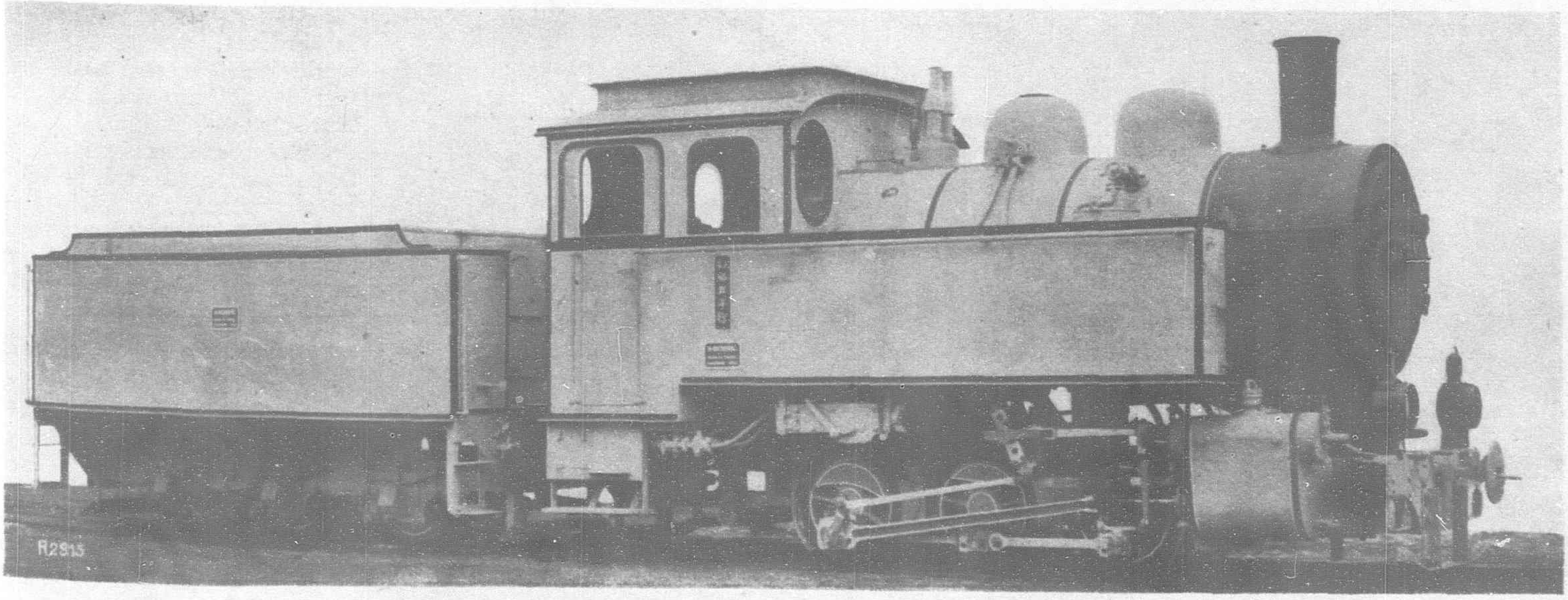
It also appears possible that the Mukden authorities will take over and operate the Peking-Suiyuan line. Some indications have appeared in the local press that the line will be operated as a portion of the Peking-Mukden Railway. Should this eventuate, considerable investment in the way of rolling stock and material will be made by the Peking-Suiyuan line as soon as operations with borrowed rolling stock from the Peking-Mukden Railway have returned a working capital,

Purchases for the Peking-Hankow and Tientsin-Pukow lines are being made almost entirely, with the exception of fairly small quantities of shop materials and supplies, from the southern terminals where the headquarters of each line are established. This situation will probably continue.

Opportunities for American Manufacturers

Representatives of American manufacturers who are closely in touch with the situation are likely to obtain a considerable share of the forthcoming business in most lines. Little opportunity exists for independent bidding by manufacturers, or for new trade connections at this time, however, as the parties already on the ground are well connected.

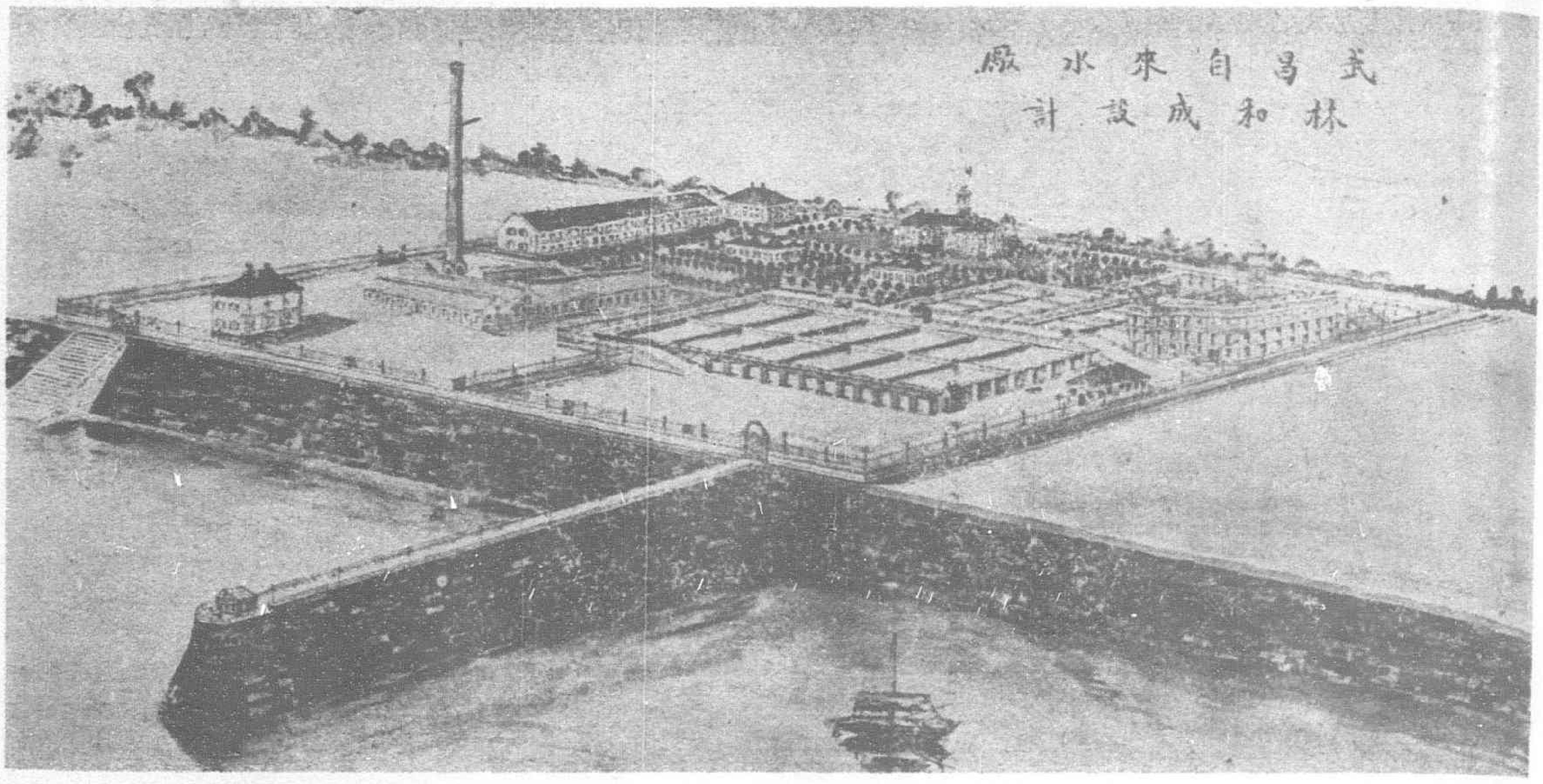
(Continued on page 176).



0-6-0 Borsig Locomotive for the Liu Chang Coal Mining Co.

The Wuchang Waterworks Scheme

By YIH CHIH UEN


武昌自來水廠
林和成設計

The Proposed Wuchang Waterworks Compound

Where the health of the community depends to a large extent upon the purity of water which is consumed by the public, and where disease is prevalent during the greater part of the year among a people who live and die in the congested area of the City of Wuchang, it is a difficult matter, indeed, to have pure water for the whole of the year without an efficient device of water purification. It has been accomplished in the cities of similar importance in this country, such as Hankow, Chinkiang, Swatow, Dairen, Port Arthur, Ningpo and Tsingtao, and now a serious attempt is being made in Wuchang to bring about the same healthy condition.

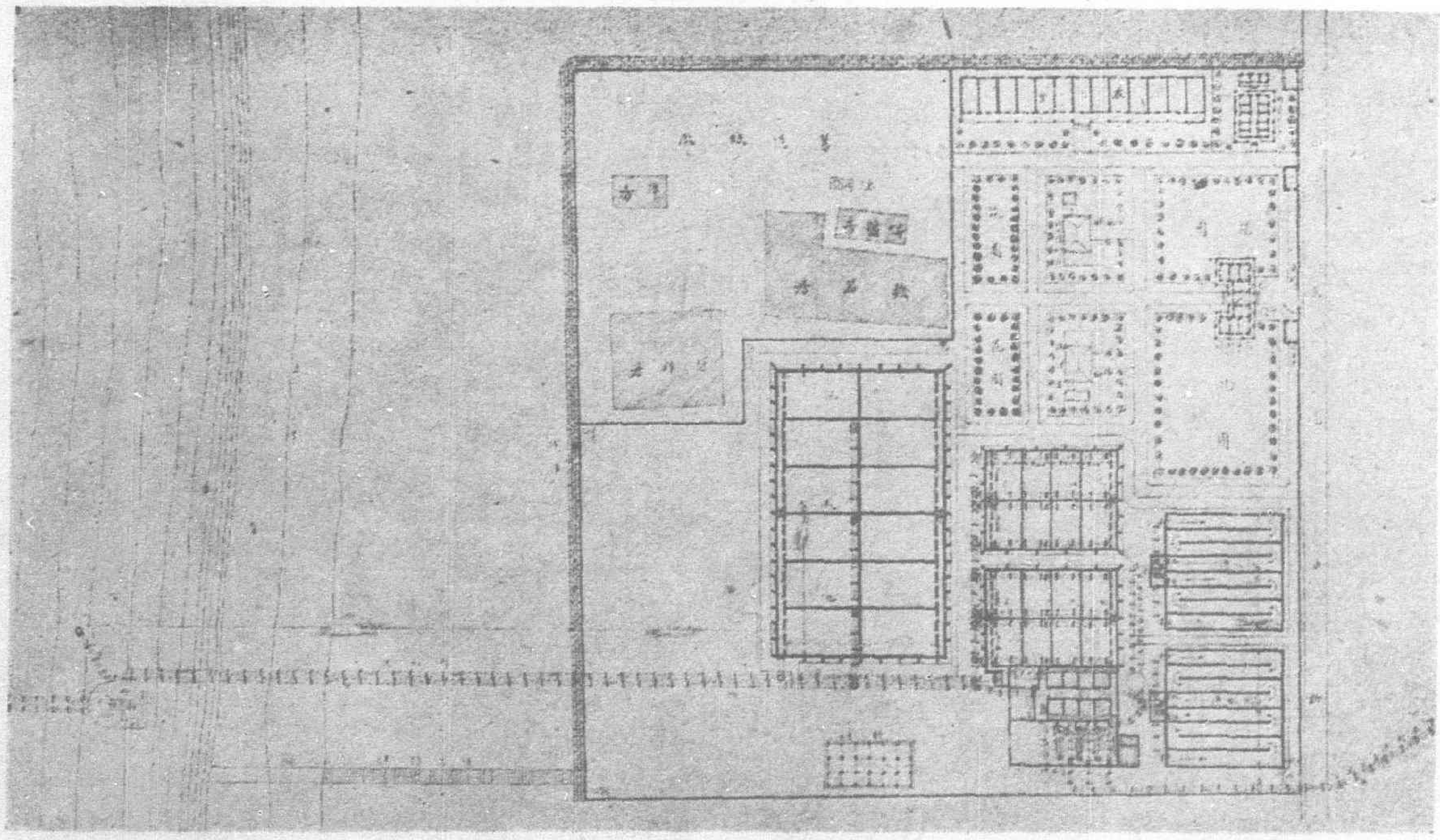
Wuchang, chief among the many claimants for the honor of starting the revolution against the Manchus, is almost in the geographic center of China. Opposite the great commercial city of Hankow, the key to the central Yangtze Valley, this capital of Hupeh is fairly important both from the stand-points of its history and economic position. The present population of Wuchang is slightly in excess of 300,000 according to the latest census of the Wuchang Public Safety Bureau. The water supply of the inhabitants has been obtained from such sources as canals within the city, tributary streams to Yangtze river, and shallow wells. The water is distributed to the consumers chiefly by men who carry two buckets of water swung from each end of a bamboo rod, which rests on a shoulder of the carrier. The net weight carried by such a porter is approximately one hundred pounds. The cost of two buckets of ordinary water varies with the length of haul from ten to thirty coppers. Water directly from Yangtze river sells for as much as eighty coppers.

The present sources of water supply and the existing system of water distribution proved to be very unsatisfactory in various standpoints.

1. The cost of water is very high.
2. There is no water under pressure and, consequently, there are very poor facilities for combating against conflagration.
3. Much of the water used, especially by the poorer classes, is of very poor quality and dangerous to public health.
4. The wells are apt to run dry during the autumn.

During the past few years, there have been two big attempts to promote a waterworks company, but none were successful. The chief causes for lack of success were difficulty for raising capital and sudden changes in local government. In most cases the leading government official was important member of the proposed company, and his disposal from office and disturbed conditions made it impossible to continue. This is about the third time that the Wuchang waterworks scheme has been revived, and now there seems to be rather more chance of its success than has previously been the case. A capital of about $1,000,000 is to be subscribed and then perhaps things will move.

The inception of the present project is largely due to Mr. H. C. Ling, the technical expert of the Wuchang Bureau of Public Works. He submitted proposals for the organization of Waterworks Preparatory Commission, in which he himself is the chief engineer. Mr. Ling has spent a long time to estimate the probable growth of the city. In the rapidly growing cities like some in the United States, the waterworks must expand as the city increases in area and population. But in an old city like Wuchang, even though it remains stationary in population, there is bound to be a continual expansion in the waterworks due to increasing demand for water as more and more of the population abandon wells or water carriers, and turn to the modern system for pure water.

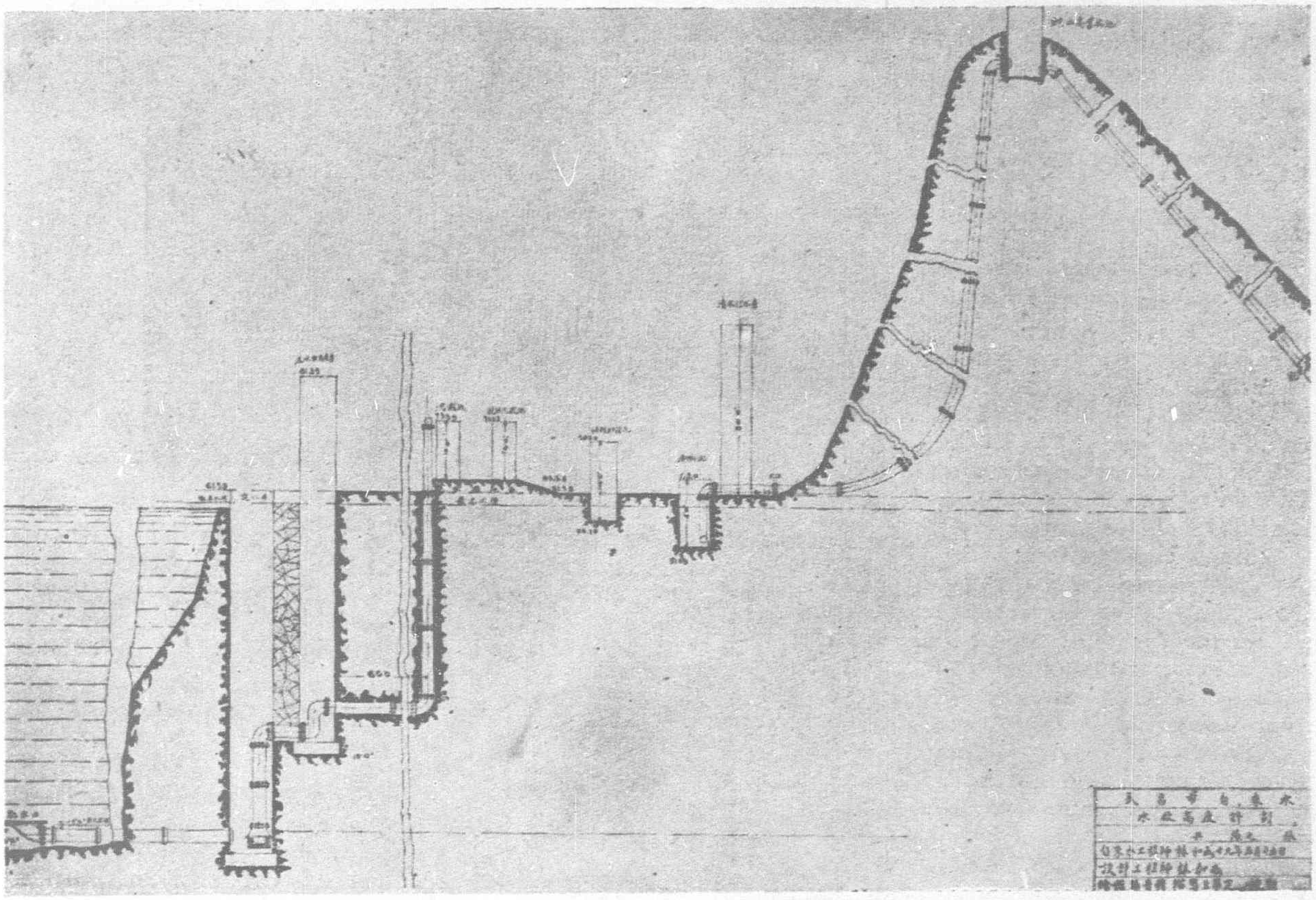


Lay Out of Wuchang Waterworks

The following preliminary surveys have been completed by the Commission:

1. To estimate of the quantity of rain and the flowing velocity of Yangtze river.

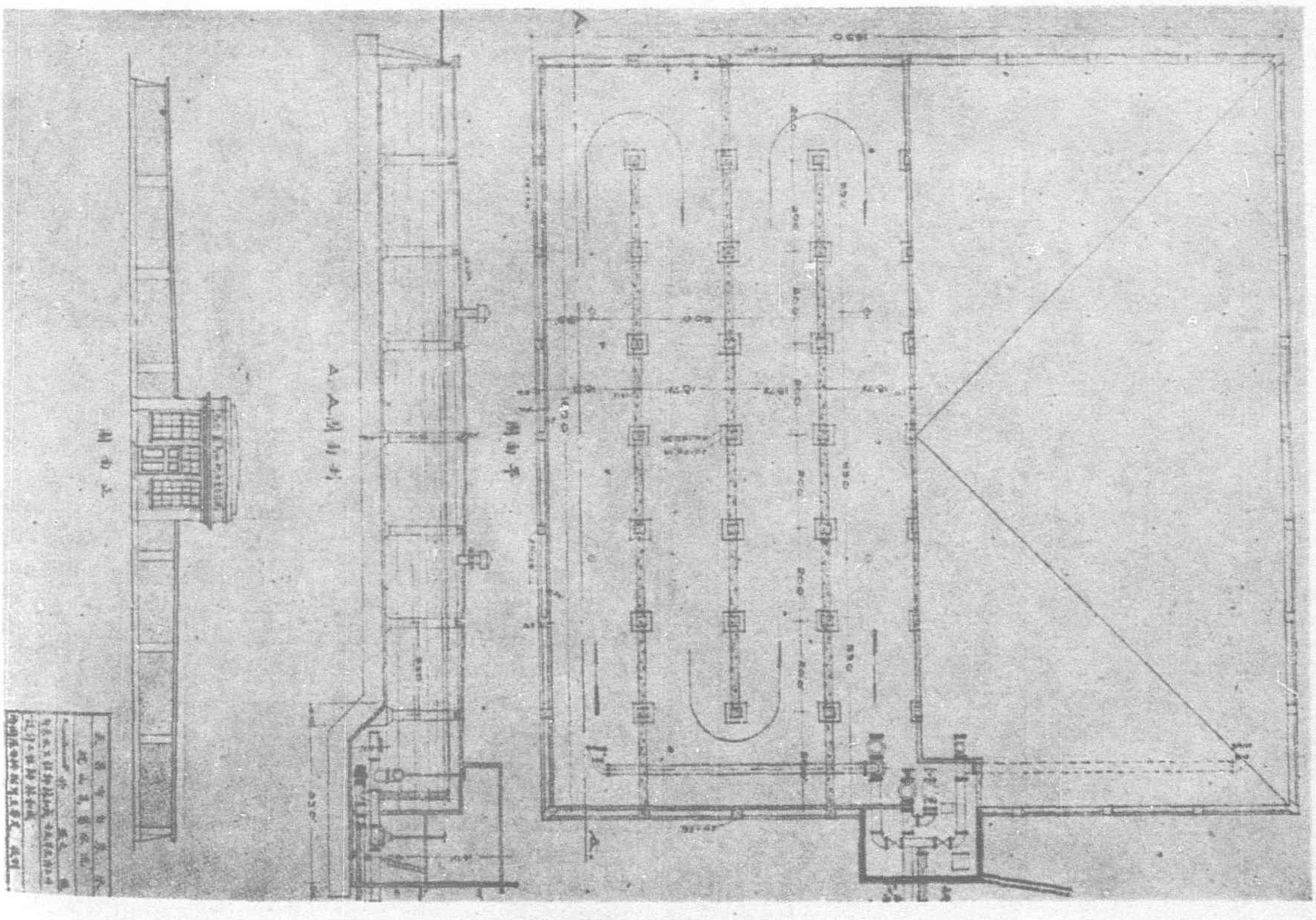
2. To survey the two areas in Peshachow and Kashihying for the future sites of water intake and distributing main.
3. To decide the powers of the various machinery and the sizes and length of various pipes.
4. To estimate the total costs of the machinery and construction.
5. To decide the network of distributing pipes.
6. To draft the rules for the issue of the waterworks bonds.
7. To draft the rules of management during the period of construction.
8. To draft the various plans for the construction of the intake, reservoir, motor room, etc., etc.



The Relative Heights of the Waterworks

All the funds for construction work are to be obtained from the sale of waterworks bonds. A total issue of $1,500,000 has been decided in the draft. It is divided into $1,000, $100, $10 and $5 pieces. All bonds are to be taken by the property owners of Wuchang. The draft also provides for the guaranty of the bonds which includes the land tax, the rent tax, the ferry revenue and the whole property and income of the waterworks itself.

The bonds will bear interest at the rate of eight per cent per annum, payable semi-annually. The bonds will be sold at hundred per cent of its face value, and two per cent will be returned to the purchaser of over $5,000 for the purpose of encouragement. Redemption of the bonds will begin in June of 1936 with semi-annual drawings. A certain percentage will be redeemed each year according to a pre-arranged schedule by which all of the bonds will be redeemed by the end of December, 1940.

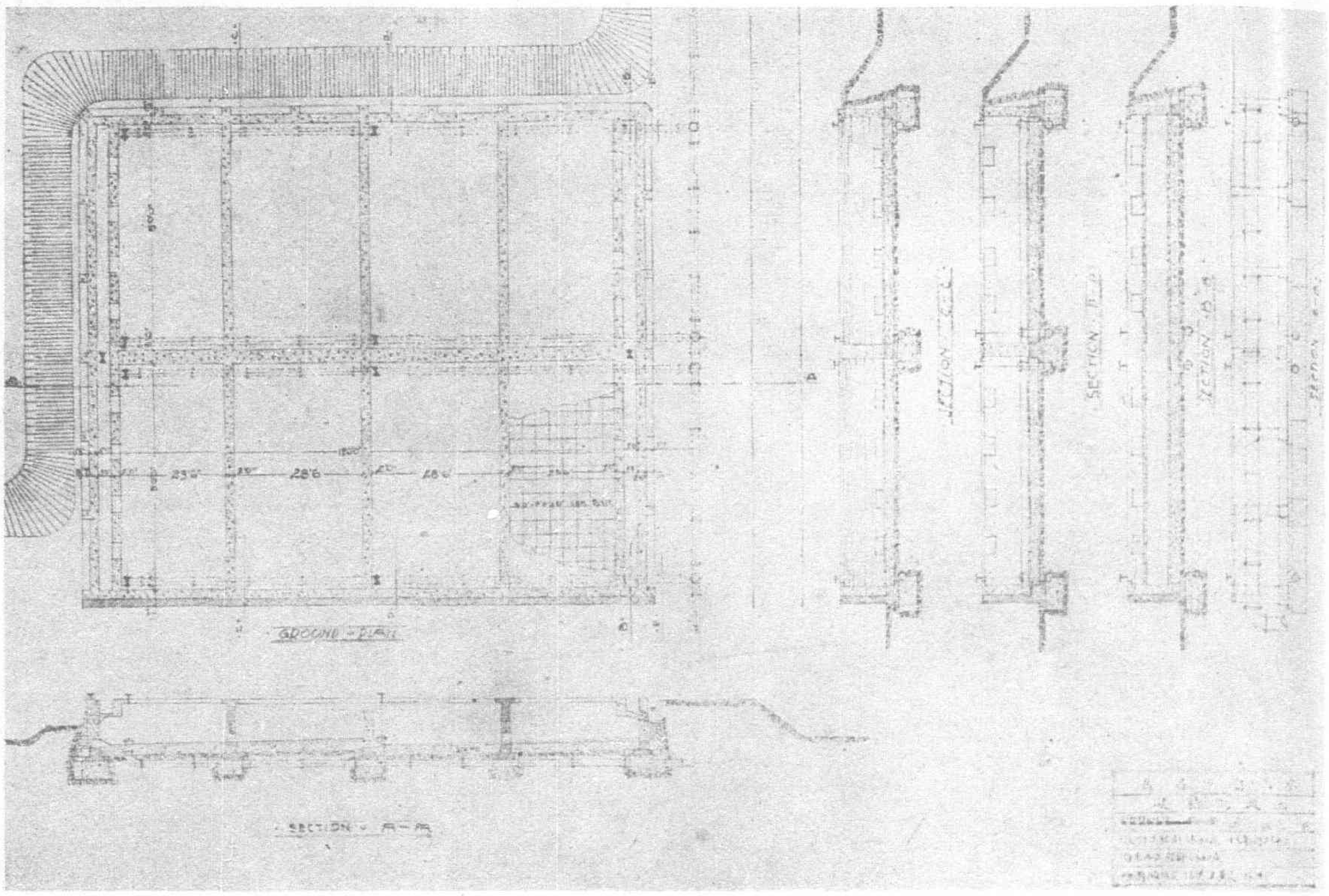


Seshan High Lift Tank

It is necessary for the engineers to estimate the probable increase in population of the city and plan the waterworks for a period of from fifteen to twenty years in the future. In planning the Wuchang waterworks, due account was taken of likely future demands and a general scheme for future development or a master plan was drawn up. Due to a number of causes, the initial works were designed as small and as cheap as possible. Some of the reasons why a small initial expenditure was advisable, or in fact imperative, are:

1. Civil war and disturbed political conditions at the time the works were being planned
2. The present extraordinarily unfavorable exchange. About 80 per cent of the cost of the waterworks is for the materials purchased abroad.

3. The undoubted fact that it is much easier to raise money to enlarge a going concern than it is to promote a new enterprise.



Settling Tanks

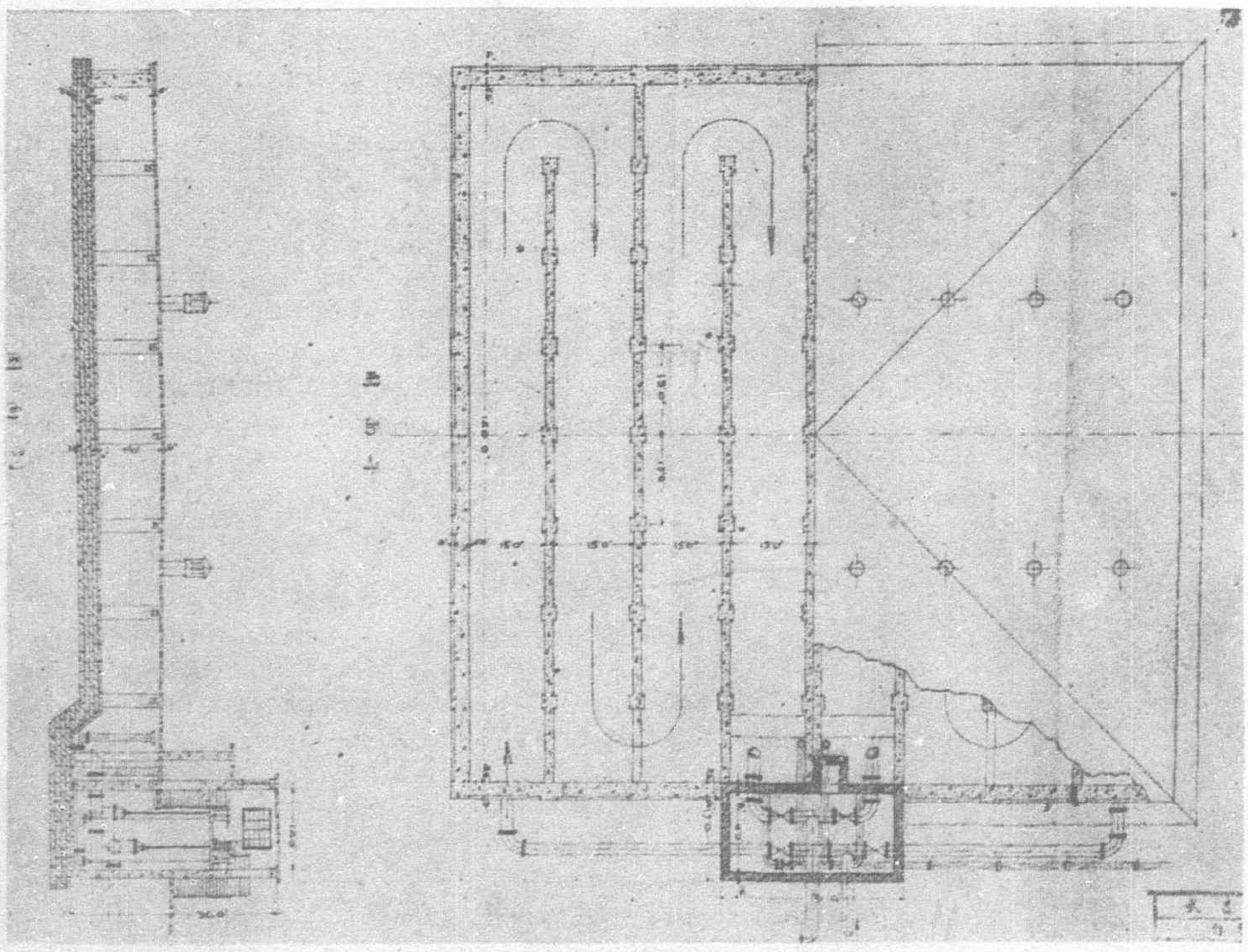
General Process

The equipment of the hydraulic machines will include the most up-to-date devices for pumping and filtration generally used in modern practice. Two intake pipes are to be located on the bank of the old site of the paper factory at Peshachow. The raw water is pumped, through the intake pipes, to the mixing channel, from which the water flows slowly through the sedimentation basin where a large percentage of matter in suspension settles down. The partially clarified water flows from the sedimentation basin to the rapid gravity filters where all remaining matter in suspension, including bacteria, is removed. The water from each filter flows to its special chamber in the regulater house, where the rate of filtration is controlled. It then flows to the clean water reservoir. High lift pumps take the filtered water to the elevated reservoir on the top of Snake Hill or Sheshan ; and through the pipe system, the public and private services and fire hydrants are connected.

Waterworks Yards

The waterworks yards will be advantageously situated on the old site of the paper factory, which has an area of more than 4,800 square feet. The velocity of the flow of the Yangtze water at that point is comparatively slower than other parts of Wuchang. The position of the waterworks is again favored by its close neighbor, the railway station, which will undoubtedly help the waterworks to save a big amount of money for the transportation of machine parts, fuel and other necessary materials. Being on the upper part of the city, the waterworks will be convenient to distribute the water to the town by natural gravity. The whole waterworks yards will have the following buildings :

One engine house
One motor pump house
One house for chlorination
One laboratory
One alum mixer
Two sedimentation basins (only one basin will be built for the beginning of operation)
Two clean water reservoirs (for the beginning of operation only one will be built)
Eight settling tanks
Two regulator houses (for the beginning, one will be built)
One rapid gravity filter
One water tower
One power house
One office building
One workers' dormitory
One general manager's residence
One chief engineer's residence
One club house for workers
One storehouse



Clear Water Reservoir

Source

The water supply of Wuchang has been obtained, as stated above from springs, lakes, wells and river. But the lakes are often silted up or contaminated by sewerage, and the wells are apt to run dry during the autumn season. It is, therefore, most reliable for the waterworks to derive the intake from Yangtze River. It is said that the yellowish Yangtze water contains certain amount of sand, which has the property to help sedimentation and kill bacteria. The width of the river has also enabled the sun to shine continuously on it and thus oxidize the water, which removes all impurities and insects. If this water is again chemically purified, there is every reason to believe that all water supplied will be potable and pathogenically safe.

The Intake

Reinforced concrete pipes are proposed for the intake, which are to be situated at the concavity of Peshachow. Yangtze River has one of the most powerful flowing velocity in China, and its variation of water level in one year is more than fifty feet. The intake pipes will be free from any effect of the strong tide of the river, as being protected by the concave location. The mouths of the pipes will be put in the bottom of the river so as to avoid the contamination of oil refuse, sewerage and other impurities into the raw water.

The Mixing Channel

The mixing channel will also be built with reinforced concrete with the depth of sixty feet, width of twenty feet and thickness of three feet. The level of water in the channel will be equal to that of the river. The intake pipes are connected to the southern part of the channel. The pipes connecting the motor pumping house and the channel are in the bottom of its northern end. A steel ladder will also be built from the top to the bottom of the channel.

The Pumphouse

The motor pumping house consists of two electric driven pumping motors, to which two pipes are connected with one to the mixing channel, and other end at the sedimentation basin. One portable lift will be installed to transport all the necessary machinery. This house will have one air compressor and electricity transformer in addition. The electricity used in the house will be supplied by the power house. Like in the mixing channel, a steel ladder will also be installed in this house.

The Regulating House

There will be a regulating house to connect the pumphouse. The house has all the apparatus to regulate the intaking water; because it is necessary to filter the water twice when, in spring and summer, the water always contains more impurities than in the other two seasons of a year, during which the water can be obtained potably by filtration for once only. The employment of this regulator saves a lot of labor and other materials in manufacturing the water.

The Sedimentation Basin

The sedimentation basin will be built in reinforced concrete. It has the storage capacity of 2,000,000 gallons of water, and it will be divided into six parts. Every part will be separated by water proof walls and connected with pipes, every end of which is regulated by automatic stopper. More than 6,000,000 gallons of water will be distributed from this basin. The flowing capacity will be 4,000 gallons per minute and its velocity at three feet a minute. The time for settling of the impurities will be three hours. Every part of the tank can be closed up for washing, which can be done in three hours.

The House for Chlorination

Chlorine can be obtained through the process of electrolysis of common salt (NaCl). Chlorine will be put in the tube and then connect it to the water pipes. It is said that the chlorination of water has the following advantages:

(1) Kill bacteria and water flea
(2) Help sedimentation
(3) Save sedimentation chemicals
(4) Prevent the fish, moss and bacteria from living
(5) Protect the pipes from corroding

The estimate of the total consumption of chlorine in one year in the waterworks will not exceed two thousand dollars.

The Alum House

The alum house will comprise of three storeys built in reinforced concrete. Various machinery will be installed for melting, mixing, and measuring the alum. A small dose of this coagulant will be added to the water before it passes into the settling tanks.

The Settling Tanks

The capacity of the reinforced settling tanks will be over 625,000 gallons. There will be altogether eight tanks, which will be separated from each other by water proof walls. The velocity of flow will be decreased to two feet per minute by the zigzag wall built in the tanks, as it is said that the water flows slower, the impurities settles down quicker. The silt will settle as the water travels and will be collected in pockets from which it is pumped by a mud pump while the tanks are in action. This avoids the enforced laying off of tanks for cleaning twice or thrice a year and also increases the capacity of the tanks from the settlement point of view by about five times.

The Filter Beds

After remaining in the settling tanks for a sufficiently long period for the suspended matter to be deposited the water is drawn off from two feet below the surface by floating pipes, and pumped to the filters. A battery of eight reinforced concrete rapid gravity filters, each stowing two and one half feet thickness of filtering sand and fifteen inches thickness of small rocks, will be constructed. Each will have a filtering area of 336 square feet, and in all 2,688 square feet. The process of filtration will be downward through the sand and rock layers, average rate of filtration being about 96 gallons per square foot per hour. Then the total for the eight beds in action will be 259,048 gallons per hour, and one whole day will filter over 7,217,152 gallons. The filter beds will be scraped in the usual way by hand, the average time between scraping being about 19 days. The dirty sand will be washed either by hand in boxes or by sand washing machine driven hydraulically by pressure water from the mains. These filters, which occupy only five per cent of the area required by slow sand filter beds, have thirty times the capacity per square feet of area, this increased filtration rate being obtained by washing every twenty-four hours with pressure water in the reverse direction to which filtration takes place, the mud collected by filtration thus being separated from the filtering materials and run to waste.

The Clean Water Reservoir

From the filters, the water flows to the clean water reservoir, which was proposed to be also constructed in reinforced concrete. The water will be taken out from the clean water reservoir through pipes system to the high lifted tank at Sheshan by two powerful pumps driven by suction gas engines. These two four cylinder engines will be installed in the clean water engine house not only to drive the pumps but also to generate two dynamos, which serves to be the sole supplier of electrical light and power of the waterworks yards.

The Sheshan High Lift Tank

The proposed reinforced concrete tank at Sheshan will have the capacity of approximately 1,500,000 gallons. The bottom of this high lifted tank will be 120 feet higher than the ordinary houses in the city of Wuchang. The water is distributed to consumers and fire hydrants by this tank at the advantage of its high situation. This tank will also regulate between rates of pumping and consumption. When the pumps are discharging faster than the water is consumed, the excess automatically flows into the regulating reservoirs. At times of high demand when pumping rate is less than consumption, the deficit is automatically made up by flow from the regulating reservoirs.

The Discharging Capacity

The discharging capacity of this proposed waterworks will be at 180,000 gallons per minute and 4,500,000 gallons per day. Fifteen gallons of water are estimated as the daily consumption per capita. Take 200,000 as the regular consumer of the water for the first few years of operation, the total demand will be 3,000,000 gallons a day. The ratio of increase of water consumer in the city of Wuchang is estimated at five per cent. Five million gallons will be needed to meet the daily demand after ten years from now. There is ample room in the present scheme for future enlargement. A 24″ diameter intake pipe and a 500 horse power suction gas engine will be installed, when the demand exceeds the proposed quantity.

The Water Pressure

From the waterworks yards to Sheshan, the water pressure will be from 240 feet to 210 feet; and from Sheshan to the farthest point of the distributing pipe at Kashihying, the least water pressure will not be less than 120 feet. There will be a very good guaranty to combat against fire within the net of the distributing pipes. Fire hydrants will be installed on the right side walks of every big street in a certain distance for the uses of both fire brigade and street washers.

The Water Service

It is said that the filter water will be absolutely odorless, colorless, tasteless and no bacteria; so that it will be drinkable even without passing the process of boiling. Private service will be set as fast as requested by property owners. Public hydrants will be installed in the residential quarters of poor and labor class, and water will be sold in retail at the price of one cent per picul. Both private and public services will be metered.

The total cost for initial construction may be seen as follows. But the following estimate cannot be taken as exact, as it was made in August, 1929, and at present exchange has not yet been settled for the payments on purchase of materials.

(A) INSTALLATION OF INTAKES (Altogether four items)		$90,000
(1) Installation of intake pipes	$10,000	
(2) Installation of mixing channel ...	20,000	
(3) Installation of motor pump house (electrically driven)	30,000	
(4) Labors for the installation of the above three items	30,000	
(B) INSTALLATION OF WATER TANKS (Altogether seven items)		$283,800
(1) House for chlorination	$20,000	
(2) Alum House	3,000	
(3) Laboratory	1,000	
(4) Settling tanks	122,000	
(5) Rapid Filter	61,000	
(6) Clean water reservoir	35,800	
(7) Sheshan high lift tank	41,000	
(C) INSTALLATION OF HYDRAULIC MACHINES (Altogether seven items)		$155,000
(1) Two suction gas engines	$60,000	
(2) Two water pumps	20,000	
(3) Two dynamos	20,000	
(4) Water Meters (big size)	5,000	
(5) Repairing implements	10,000	
(6) Portable lift	20,000	
(7) Labors for the construction of the above six items	20,000	
(D) INSTALLATION OF PIPES (Altogether three items		$411,000
(1) 4-in. to 24-in. steel pipes	$300,000	
(2) Fire hydrants, water meters (small size) etc., etc.	40,000	
(3) Labors for installation	91,000	
(E) CONSTRUCTION OF THE FACTORY HOUSES (Altogether five items)		$53,000
(1) Workers' dormitory	$ 5,000	
(2) Storehouse	5,000	
(3) Walls and ditches	10,000	
(4) Bridges	30,000	
(5) Compensation for removal of civilian's households	3,000	
Grand Total		$996,800

It is also estimated that the salaried staff of the proposed waterworks will consist of the following members:

1. One director of the waterworks administration
2. General office; one chief, two assistants and three clerks
3. Business office; one chief, three assistants and nine clerks
4. Accounts office; one chief, three assistants and three clerks
5. Engineering office; one chief engineer, three assistant engineers and one general assistant
6. Materials office; one chief, three assistants and three clerks
7. Engine House; two foremen and ten laborers
8. Motor pump house; two foremen and six laborers
9. Water tanks; two foremen and thirty laborers; and
10. Miscellaneous workers ten.

The monthly wages for these 39 office workers and 62 laborers are estimated at seven thousand dollars. Together with the following four items, the current expenditure for operating the waterworks will be approximately at $600 a day and $18,000 a month.

(1) Fuel $200 a day	$6,000 per mensem
(2) Material	2,000 ,, ,,
(3) Office appliances	1,000 ,, ,,
(4) Miscellaneous	2,000 ,, ,,

The proposed Wuchang waterworks will be able to distribute 4,500,000 gallons a day. Take one half of the total filtered water to be sold and take eighty cents as the price per thousand gallons, its daily income will be $1,800 or $54,000 monthly. If the demand of water in Wuchang will be increased to three million gallons a day, the income will jump to $2,400 a day or $75,000 a month.

According to the above estimate, the balance of the waterworks' accounts will be exceedingly profitable. At least the waterworks will gain a net profit of $36,000 a month. If the later estimate is correct, its net profit will be promoted to $52,000 instead of the above amount. Considering $1,200,000 of capital to have $36,000 of monthly profit or a yearly surplus of $432,000, or the interest over 36 per cent per annum, there is every reason to believe that the city of Wuchang will be developed and the business of the waterworks will be prosperous, should the administrative authority make good use of the surplus.

New Locomotives for Chinese Railways

(Continued from page 171).

Borsig Locomotives in China

Another German locomotive manufacturer whose products are well known throughout the world and who last year supplied 128 engines for the Yugo-slav State Railways, has been successful in a recent order for a 0-6-0, narrow guage (2′ 6″) locomotive, delivered to the Liu Chang Coal Mining Company. These locomotives are manufactured by A. Borsig, G. m.b.H. of Berlin-Tegel, and sold through their agents in China. On page 19 will be found an illustration of this locomotive and the particular follows:—

Diameter of cylinders	14 3/16″
Stroke of piston	15 ¾″
Driving wheel diameter	2′ 7½″
Rigid wheel base	6′ 7″
Steam pressure per sq. inch	180 lbs
Heating surface	646 sq. ft.
Grate area	14.5 sq. ft.
Tractive force.	11,000 lbs.
Tank capacity	330 Imp. Gals.
Coal capacity	0.8 tons
Weight empty	19 tons
Weight in working order	25 tons
Tender:	
Weight empty	5.5 tons
Weight in working order	15.5 tons
Tank capacity	1,450 Imp. Gals.
Coal capacity	2.5 tons

China's Own Radio Communications

THE completion of the Chen-ju Radio Transmitting Station in December last is a distinct achievement of the Ministry of Communications of the National Government, the result of plans formulated by Minister Wang Pe-chun mmediately after he assumed office. The original plans called for the erection of a wireless station in Pootung and orders were placed with a French firm for the apparatus. Meanwhile, the National Reconstruction Commission also planned to establish international radio stations at Chen-ju, Paoshan and Liuhong, with a branch at Fengling-chiao, but this work was subsequently taken over by the Ministry of Communications.

The Fengling-chiao station was completed last March establishing direct radio service between China and Hongkong, the Philippine Islands and the Dutch East Indies. The Chen-ju station was completed in November.

The Chen-ju transmitting station, together with the receiving station at Liuhong and the Markham Road and Fengling-chiao stations, is part of the Shanghai International Radio Station, the apparatus of the first two stations being purchased from the Radio Corporation of America and the Society Francaise Radio and installed by Mr. B. W. Chong, chief engineer on construction, and several assistant engineers. Construction was supervised by Mr. Cecil Bailey, R. C. A. engineer, and M. Sauve, S. F. R. engineer, who were assigned by their respective interests to assist.

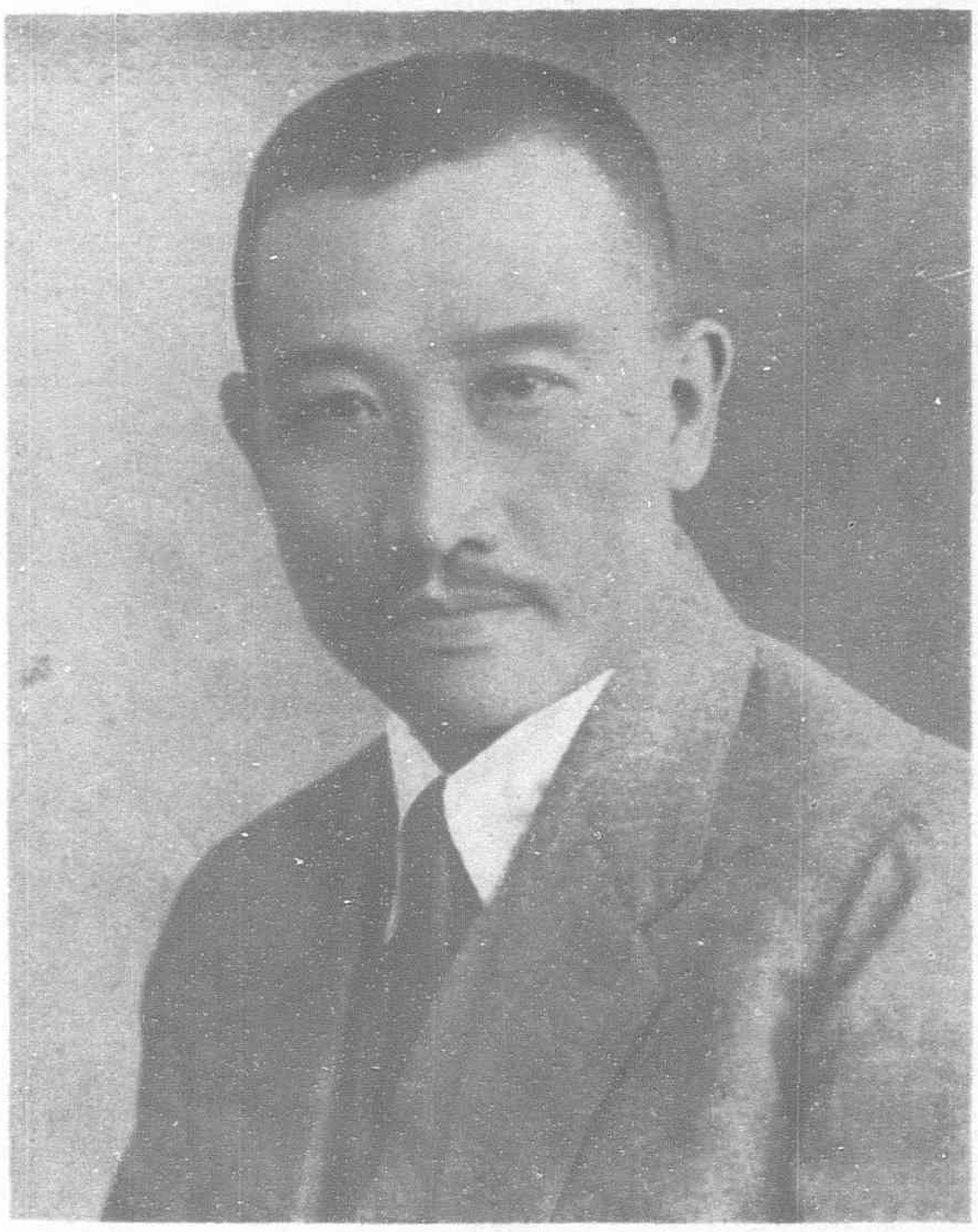
The Radio Corporation of America, acted in an advisory capacity to the Shanghai International Radio Station, the station being sold outright to the Chinese government, and the R.C.A. having a working traffic agreement to handle messages on the American end. The R.C.A. assigned Mr. George F. Shecklen, traffic expert, and Mr. Cecil Bailey, engineer, to assist in getting the station to function properly and to make it a success. Branch stations are to be erected in Tientsin, Hankow and Canton to complete the main national system.

The completion of the Shanghai wireless stations brings to a close the long drawn out diplomatic dispute over the validity of the original Federal wireless contract with Peking, which conflicted with a previous agreement entered into with Mitsui & Co., for the erection of a high-powered wireless plant near Peking on terms which gave to the Japanese contractors a virtual monopoly until the construction costs were repaid from revenues. It was a fair enough agreement at the time and under the circumstances, but two years later, the Peking Government, signed another contract with the American company, precipitating a diplomatic incident between America and Japan.

The controversy which followed has never been settled. The Japanese government protested against the execution of the American contract as a violation of the Mitsui agreement, while Washington retorted that the latter constituted a monopoly and therefore a violation of the Open Door agreements. Japan was willing to co-operate, but the Americans rejected any compromise. Meanwhile, the Japanese station near Peking was built, but with the shifting of the capital to Nanking, it became essential to meet the communications needs of the new government and the commercial interests of Shanghai.

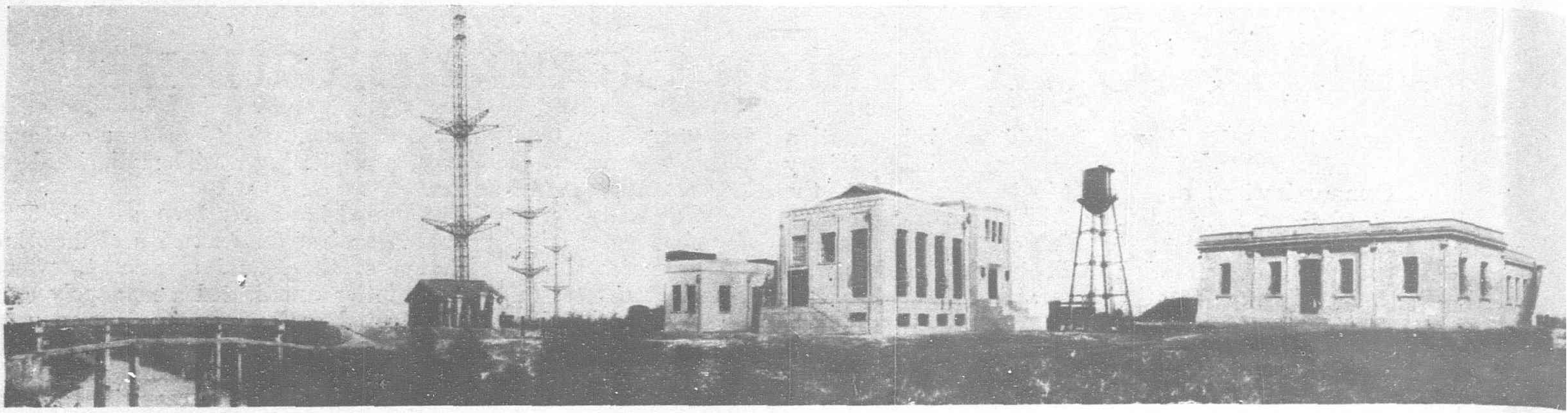
Strong protests were lodged by the Japanese Minister with the National Government against the construction and operation of the Chen-ju station, but no reply was vouchsafed by Nanking. It seems a pity that such a distinct advance in the reconstruction of the country and in world communications could not have been effected by some amicable compounding of the conflicting interests of Japan, America and China. Japan advanced $5,000,000 to China for the Peking radio plant and the R.C.A. has an investment of $2,400,000 on its Federal wireless contract. Both concessions are now invalidated by the establishment of the Chen-ju station.

It is difficult to comment on the merits of this dispute. In the last analysis, the National government and the commercial interests of China were being penalized by the absence of radio communications with the rest of the world, and it was much easier for Nanking to erect an entirely new station than to await a diplomatic settlement of the dispute. In view of the adamant position taken by Washington and the equally firm attitude of Tokyo in upholding the legality of their respective contracts, no immediate solution was possible. Nanking broke the deadlock by entering into contracts for the erection of an entirely new radio central at Shanghai, and assumes responsibility for breach of former contracts. Mitsui and the R.C.A. have a claim for damages against the Chinese government, which will undoubtedly be equitably adjusted when other more important problems have been disposed of. In the meanwhile, the National government has broken the cable monopoly and enjoys unrestricted communication with the rest of the world over its own system.



Wang Pe-chun, Minister of Communications

Mr. Lu Kwei-hsiang, Director of the Bureau of International Electric Communications



Panoramic View of New Chen-ju Wireless

C. G. R. A.

China Completes the World's Air Circuits

By GEORGE STREET, Commercial Representative and CECIL BAILEY, Engineer, Radio Corporation of America

HISTORY has shown that there is no more vital factor in national growth and development than that of adequate communication facilities, and by blazing new trails across the oceans and continents radio is worthily upholding its tradition of success in the field of international telegraphic communications. The new service to and from China provides a much needed additional outlet, and it encourages a freer exchange of commercial messages and news........

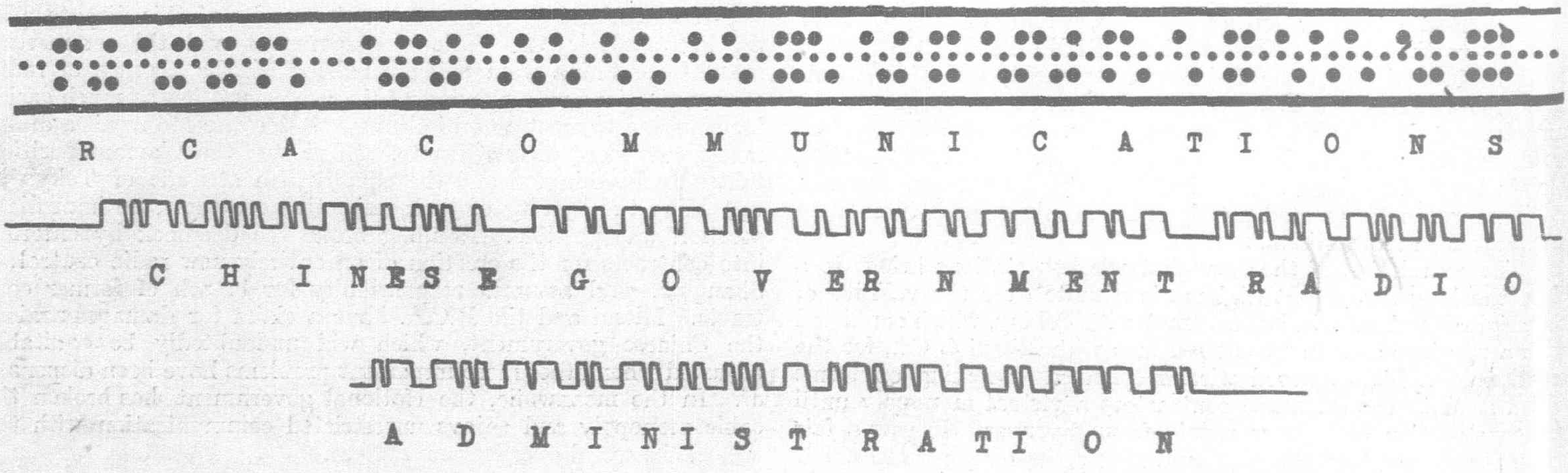
Since the early part of December 1930 the RCA built radio-telegraph transmitters at Chen-ju have been in continuous operation handling message traffic—Radiograms—to all parts of the world affording the most direct and most modern means of electrical communications to exterior countries.

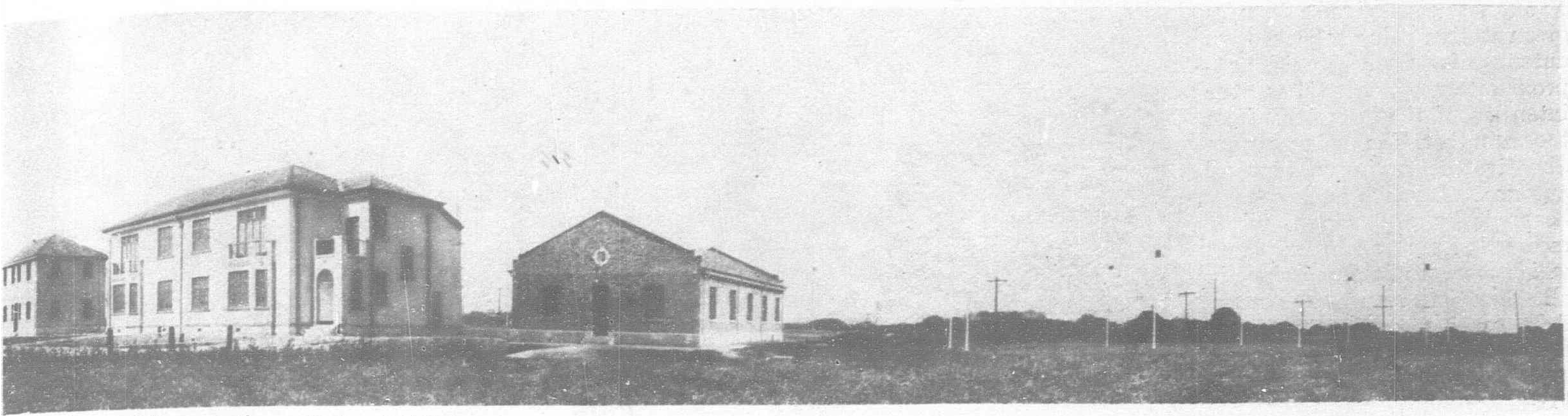
The Chinese Government Radio Administration Shanghai terminal of this international communication system consist of three essential units ; (1) the central office and operating headquarters in the Sassoon House ; (2) the transmitting station at Chen-ju and (3) the receiving station at Liu-hong. These three units are interconnected by so called control lines and tone channels enabling the actual operation to be performed directly and instantaneously from the central office in Sassoon House.

Colonel Curtis H. Nance, Far Eastern Manager, Radio Corporation of America

The central office equipment is composed of the latest types of automatic message handling apparatus together with associated storage batteries, panel switchboards, motor-generators and other auxiliary gear.

Outgoing messages are "punched" on a machine resembling an ordinary typewriter and known as a tape perforater. This device punches a combination of holes corresponding to the dot and dash signals of the morse telegraph code on a narrow ribbon of paper tape. This perforated tape in turn is fed into an automatic keying machine which is connected directly with the actual radio transmitter at Chen-ju by means of the control lines. In this manner the Chen-ju transmitters instantaneously function and puts the radiogram "on the air." Incoming messages are taken care of in a somewhat reverse manner being intercepted by the receiving apparatus at Liu-hong. The signal output from Liu-hong receivers is connected directly to the central office by means of the ordinary telegraph wires known as tone channels and is thus instantly received in the operating room and automatically recorded in morse code characters on a strip of paper tape similar to that used in transmission. This tape is then rapidly transcribed by an expert operator to the radiogram form and the message is then ready for delivery.


R C A C O M M U N I C A T I O N S
C H I N E S E G O V E R N M E N T R A D I O
A D M I N I S T R A T I O N

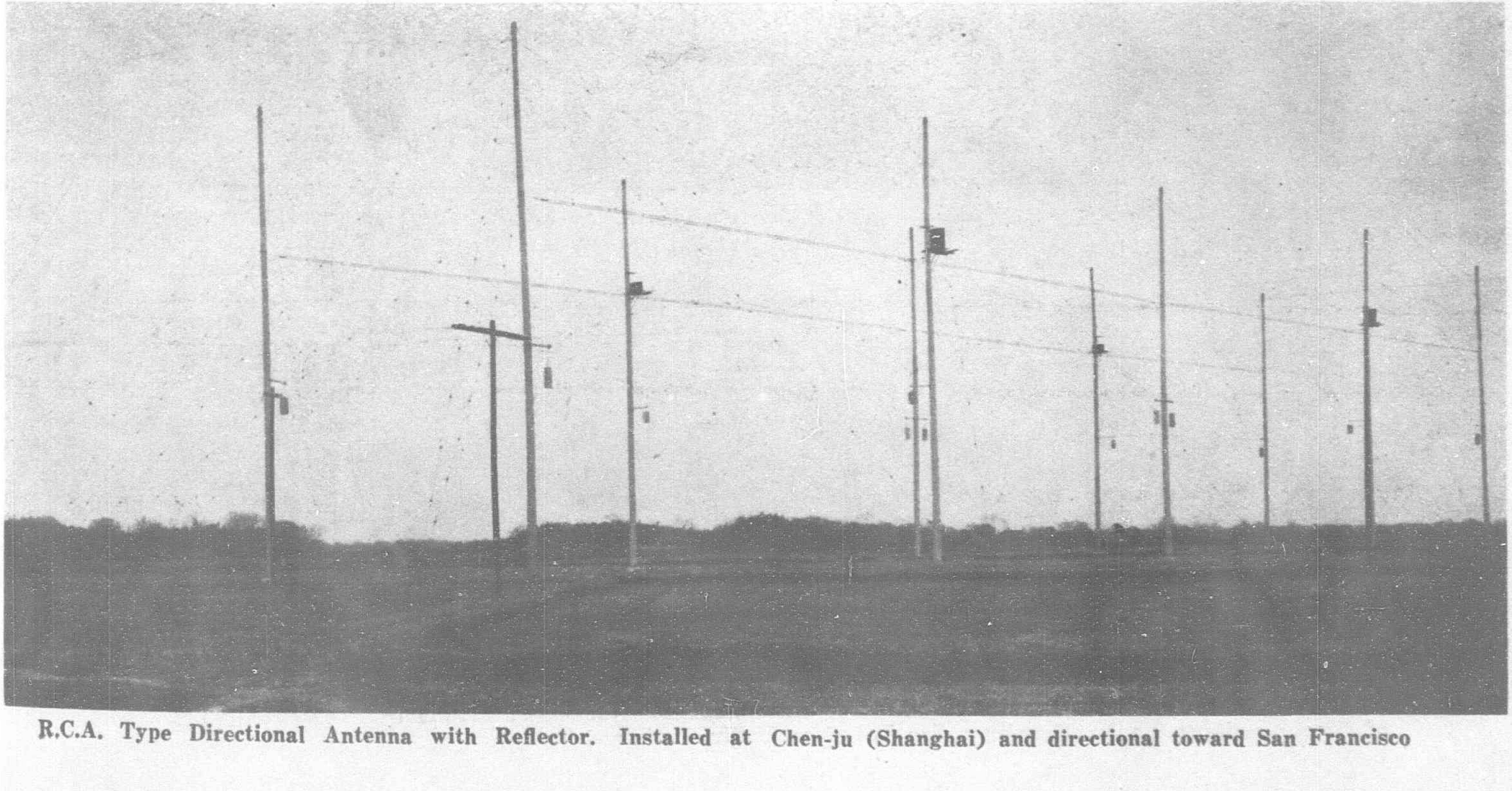


Transmitting Stations of the C.G.R.A.

Liu-hong, the receiving station, is located about six miles west of Woosung or about sixteen miles north of Shanghai. Such a location was primarly chosen for the receiving site to eliminate the various forms of electrical interference or "man-made static" which is characteristic in the immediate neighborhood of any large city. Another consideration necessary in selecting a site for a commercial installation, either for reception or transmission, is the fairly large acreage required for the erection of the various buildings and antenna systems. The several sets of receiving apparatus are centralized in one building and are capable of being adjusted by the attendant for simultaneous reception of several signals from the various distant stations with whom communication is regularly carried on. Another building houses the power supply apparatus consisting of Diesel driven generators. These generators supply power for lighting and general utility purposes as well as the current for operating the several receiving units.

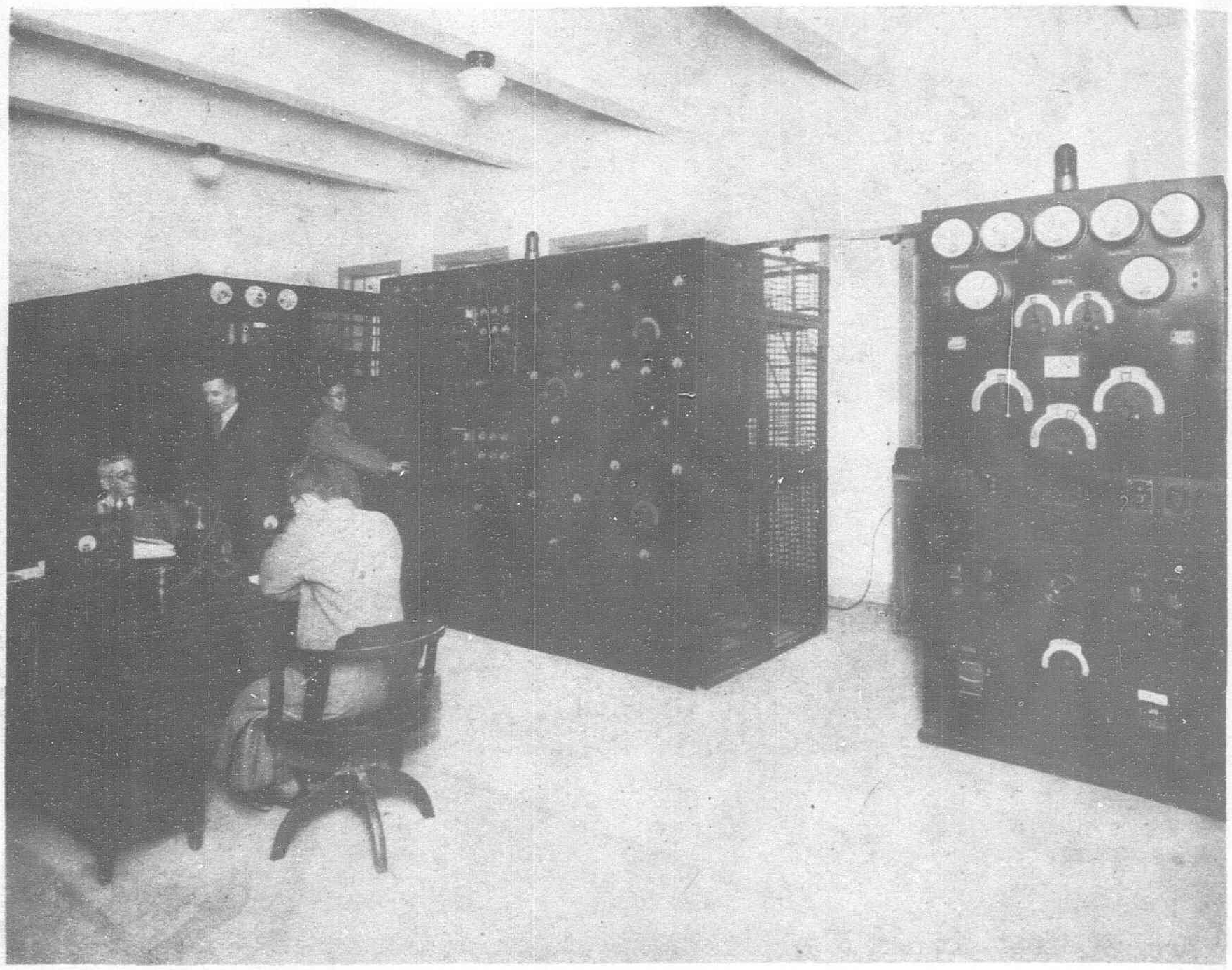
The antennae used in commercial work are considerably more elaborate and complicated than the type with which the average radio fan is familiar. The antennae in use for reception are designed for efficient reception from one direction only. This necessitates an antenna structure of comparatively large dimensions in proportion to the frequency or wave-length used and also necessitates careful construction and adjustment of the component parts. Directive antennae are used at the receiving station for the purpose of eliminating interference from directions other than that from which it is desired to receive. At the transmitting station antennae having similar characteristics are used in order to concentrate the radiated energy in a comparatively narrow beam.

Group on the steps of the Chen-ju Power House (Shanghai Radio Central):—left to right George Street, Acting Commercial Representative RCA and RCP; S. Chaiet, Far Eastern Review; George F. Shecklen, Commercial Representative RCA and RCP and advisor to Ministry of Communications an Chinese Government; Cecil Bailey, RCA Engineer



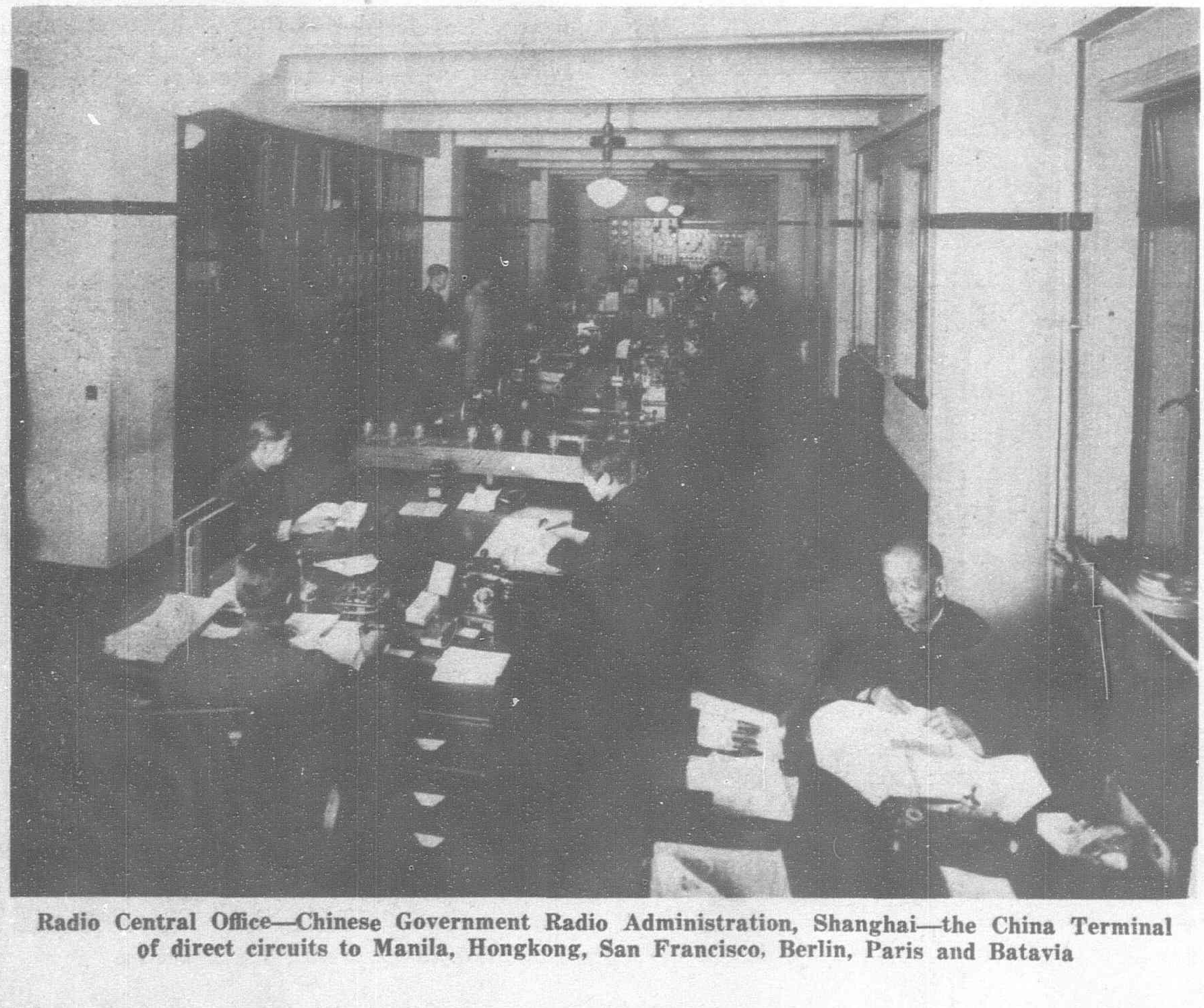
R.C.A. Type Directional Antenna with Reflector. Installed at Chen-ju (Shanghai) and directional toward San Francisco

The energy received from a given station using a beam type antenna is received with approximately forty times the intensity of that received from the same station using a non-directive or ordinary type of antenna. A rough anology may be made by comparing the light radiated from an open lamp which spreads its radiation in all directions and a searchlight which concentrates its rays in a very narrow beam.



R.C.A. 20/40 Kilowatt Transmitter No. 1 at Chen-ju (Shanghai) China. Used principally for the Shanghai-San Francisco channel

The transmitting station is located near Chen-ju on the Shanghai-Nanking railway about ten miles northeast of Shanghai. For the benefit of those readers who are interested in modern radio practice the following is a brief description of the transmitters supplied by the Radio Corporation of America. These units are of the master-oscillator power-amplifier type. The master-oscillator consist of a 7½ watt radiotron crystal controlled with thermostatic regulator to hold the crystals at constant temperature. The crystals oscillate at a frequency of one-eighth of the output frequency. The master-oscillator feeds into a buffer amplifier the object of which is to prevent reaction of the following high power stages upon the crystal. Following the buffer amplifier stage is a 75 watt radiotron and its associated circuits which acts as an amplifier and frequency doubler. This unit in turn feeds another similar unit which performs the same function. The output from this later unit is delivered to a circuit containing a 750 watt screen-grid tube which also acts as an amplifier and frequency doubler. This unit in turn feeds a balanced amplifier consisting of two 750 watt screen-grid radiotrons in a standard push-pull circuit. The above master-oscillator and associated amplifiers together with the necessary rectifiers, transformers, filters, etcetera comprises a complete self-contained transmitter the output of which is 1,000 watts or more. The final amplifying stage which actually feeds the antenna system is a unit in itself and uses our 20 kilowatt water-cooled power radiotrons connected two in parallel on each side of a push-pull circuit. The twelve thousand volts required for the plates of these tubes is derived from a special three phase full-wave rectifier using six water-cooled heavy duty rectotrons. This type of transmitter is capable of supplying from 20 to 40 kilowatts of radio-frequency energy to the antenna system on wavelengths between 14 and 45 meters and is the highest powered shortwave transmitter so far developed.



Radio Central Office—Chinese Government Radio Administration, Shanghai—the China Terminal of direct circuits to Manila, Hongkong, San Francisco, Berlin, Paris and Batavia

The direct circuits operated by the Chinese Government Radio Administration from the Sassoon House central office are in constant operation to San Francisco (North and South America), Manila, P.I., Hongkong, Java, D.E.I. and Berlin (all European countries). The Paris and Tokyo circuits are expected to be inaugurated in the very near future.

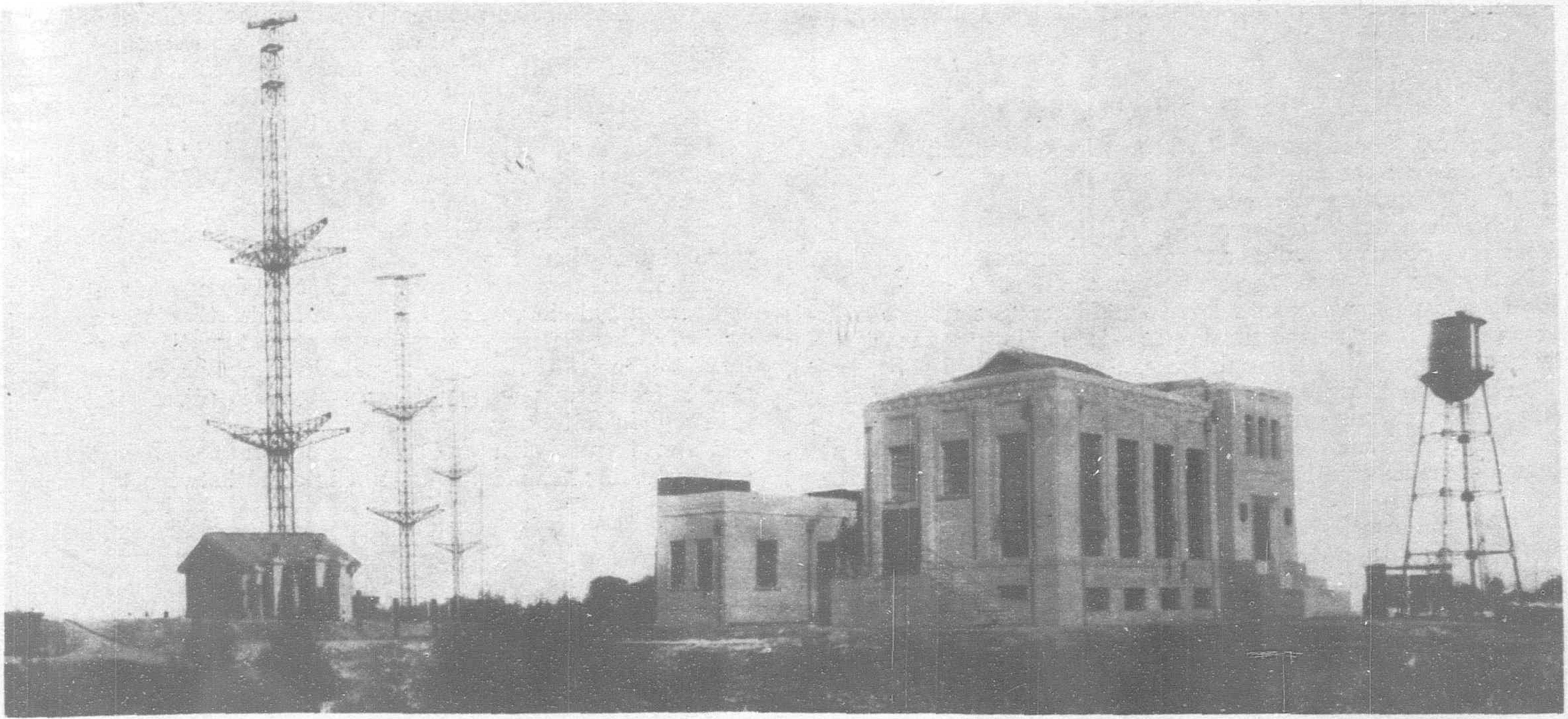


Fig. 2.—The Transmitting Station at Chenju: showing the French-beam Aerial and the Main Building

French Equipped International Wireless Station in Shanghai

By M. PAVLOVSKY and H. SAUVE

The International Wireless Station inaugurated in Shanghai by the Ministry of Communications at the end of last year is a most up-to-date short-wave installation which can be favorably compared in every respect with any of the existing world wireless centers, such as St. Assize (Paris), Berlin, Rugby, Saigon, San Francisco, Buenos Aires, etc. The equipment for operating the traffic between China and Europe through the direct radio circuit Shanghai-Paris has been supplied and erected by the Sociétè Francaise des Telephones Interurbains, the Chinese agents of the French Associated Wireless Companies.

The problem of a direct and reliable wireless communication between Shanghai and Paris had to be settled for the first time, and represents a very important technical achievement.

In radio practice we already have direct communication between points more distant than from Paris to Shanghai, but so far there is no existant wireless circuit of similar length which passes entirely across land, where the transmission is much more difficult than across the seas. A direct and commercially reliable wireless link had to be established across the whole of the continents of Asia and Europe, and the problem has been most successfully solved. The direct wireless traffic between Shanghai and Paris, as well as between Shanghai and Berlin, is now officially and regularly operating, and the public is beginning to appreciate the value of the new service.

Like every modern wireless center, the Shanghai center is composed of three main parts:

1.—The transmitting station, installed at Chenju, 10 miles N.W.W from Shanghai;

2.—The receiving station, installed at Liuhong, 16 miles N.W of Shanghai; and

3.—The central operating office, installed in the business center of Shanghai, in the premises of the Sassoon Building,

M. Henri Sauve, Engineer of the Societe Francaise Radio—Electrique

M. Pavlovsky, Representative of the French Associated Wireless Companies in China

M. Michel Gouriaud, Engineer of the Societe Francaise Radio—Electrique

and connected by direct cables with the transmitting and the receiving plants.

Central Radio Office

The real "headquarters" of the wireless center is the central office, where are concentrated all the operations of the transmitting and of the receiving stations, which are controlled automatically.

The Shanghai "Headquarters," in the Sassoon Building is in direct and permanent day and night communication with Paris "Headquarters," established also in the busiest center of the city (166 Rue Montmartre), less than 100 meters from the Paris Exchange. The Paris central office is similarly connected by direct cables with the transmitting center, established at St. Assize, 32 miles from Paris, and with the receiving center, established at Villecresnes, 16 miles from Paris.

Observed from the central office, the operations for the exchange of traffic with Paris and for the maintenance of a permanent contact between both the Shanghai and Paris "Headquarters" seem to be very simple and do not require any special skill.

The equipment of the Shanghai Central Radio Office is shown in Fig. 1. In fact, this equipment is very similar to any modern high-speed telegraph equipment for communication by wire or by submarine cable. The transmitting of the messages requires two operations:

(*a*) Preparation of a perforated paper strip on which the text of the message is translated in perforated telegraph signs.

This operation is done by one of the three perforating machines. A perforated strip is prepared by typing out the telegram on an ordinary typewriting keyboard.

(*b*) Passing the perforated band through the automatic transmitter. Usually long bands are prepared, containing several telegrams, following one after the other. The automatic transmitter is working at a high speed up to 100-120 words per minute, and thus the time for the transmission is very short. The automatic transmitter is directly connected with a Baudot relay installed in the transmitting station at Chenju. The relay repeats the signals to the wireless transmitter. Thus, simultaneously with the passage of the perforated band at the Sassoon Building's office, the high-speed signals are sent by the Chenju transmitting station and are instantaneously received through the Villecresnes receiving station by the Paris central office.

The operation for receiving the telegrams from Paris is even more simple than that of transmission.

The signals received from Paris at Liuhong are sent by cable to Sassoon Building, where they operate directly either a recording device, called an undulator, producing automatically on a paper band the inscription of the signals in telegraph alphabet, or the signals from Liuhong operate an automatic direct printer, which prints plain letters on a paper strip.

The transmission and the reception are operated simultaneously, in "duplex." In the interval between the exchange of telegrams Paris and Shanghai are constantly exchanging service notes, checking the number of words, the class of telegrams, giving repetition in case of mutilations, and doing in general all the routine work which a modern telegraphic organization may require.

The simplicity of the central office's operations is, however, obtained by means of a very elaborate equipment both in the transmitting and in the receiving stations, which are the real working centers, carrying out the orders of "Headquarters."

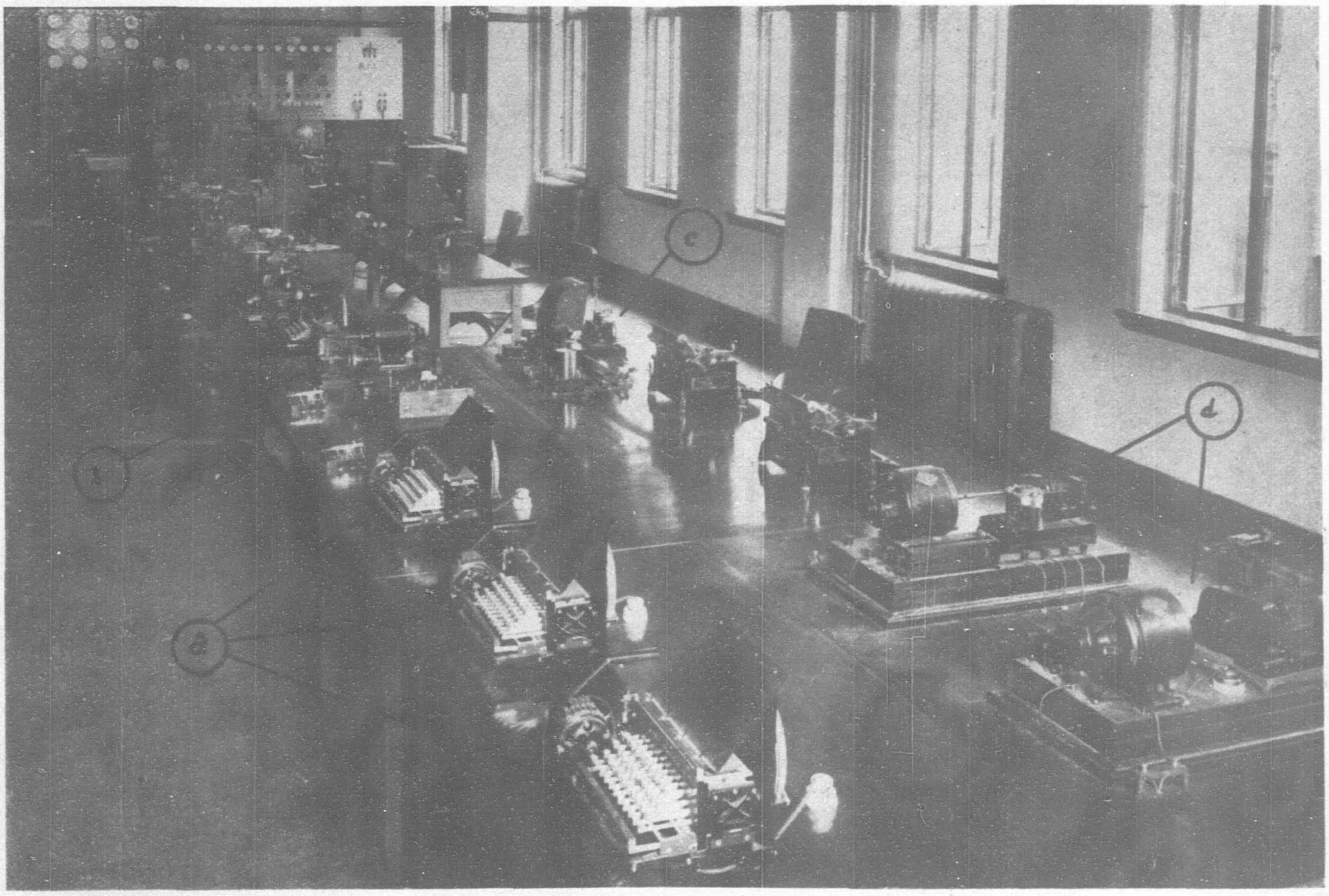


Fig. 1.—Central Radio Office, installed in Shanghai (a) Perforating Apparatus; (b) Automatic Transmitter; (c) Undulator; (d) Direct Printing Machines

French Systems of Directional Aerials

One of the outstanding features of the French short-wave equipments, which make them different from any other short-wave systems, is the directional aerial, called "French Beam" aerial, which is employed both for transmitting and for receiving purposes.

It was mainly this directional aerial, developed by the French engineers, Messrs. Chireix and Mesny, which enabled the attainment, with a relatively small power, of stable and reliable communication on most of the long distance wireless links.

The recently established direct wireless *telephony* communication between Paris and Buenos Aires, Paris and Batavia, Paris and Saigon, etc. are due to the employment of the above directional aerial.

The efficiency of the French aerial is coupled with the simplicity of its construction, requiring very limited space, and also with the simplicity of tuning and regulation.

The French system of directional aerials is composed of two antennas, one active fed by high frequency current supplied from the transmitter; the other, identical with the first one, non-fed and acting as a reflector to insure an undirectional radiation of electro magnetic waves.

These antennas look roughly like two big vertical nets, the plans of which are directed perpendicularly with the direction of the corresponding station. They are suspended under two triaties stretched between the tops of two masts. The two antennas are distant about one-quarter wave-length, the active antenna looking towards the corresponding station. The active antenna is fed in its center by two vertical parallel wires on opposite phases coming from a coupling box, where it is connected to the feeder line coming itself from the transmitting set. In that box an electric bridger permits to attack the antenna with the proper phase, and to eliminate from the feeder line all stationary waves which would radiate and waste power.

This feeder line is composed of two concentrical tubes, the outer one connected to earth and the internal one properly insulated, acting really as a high frequency power line, which sometimes may have a length of several hundred yards.

As stated above, the reflector network is not fed; it is also fitted with a vertical bi pilar line attached to its center exactly as is the case for the active antenna; but this line leads only to a wooden pole, named the tuning element. Then it is short-circuited in such a place as to give a minimum of radiation in the direction opposite to that of the corresponding station.

The networks are composed of four rows of teeth, whose sides, inclined at 45°, have a length of one-half wave. Each row is composed of a single wire, and they are fed in their center by the bipilar vertical line referred to above. These rows of teeth are insulated from each other by pyron insulators. In addition to these four rows, the net-work includes two more rows of teeth, one above and one below, which are not fed and are termed shadow zones. Their purpose is to absorb a great part of the local wasted induction, recuperate it and radiate it with the proper phase so as to increase the efficiency of the aerial.

The directional aerials made for receiving are identical in shape and work to the transmitting aerials, but as they do not radiate any energy, they have no shadow zones.

The working of the antenna is as follows:—

All along one row of teeth stationary waves will be developed by reflection, and if one angle is fed on a maximum of tension the currents will be equal and opposed in phase in each successive side of the teeth.

The two fields due to the side currents will give vertical resultants all in phase. Now, it is easy to fit up the other rows in such a way as to obtain the same phase for all vertical resultant fields. The electric field will thus be polarized vertically as it is in an ordinary aerial, and the maximum energy will be radiated perpendicularly to the network in the horizontal direction, which is the most effective.

The waves radiated by the active antenna towards the opposite direction of that of the corresponding station meet the reflector and induce in it currents. Their resultant electro-magnetic field is in opposition of phase with the phase of the electro-magnetic field of the incident wave, and cancels it almost completely, so that no energy can be radiated in that direction. But the reflector being placed at a quarter wave length from the antenna, the induced electro-magnetic field in opposition of phase radiated from the reflector will meet the active antenna after two quarter wave lengths or one-half wave length, and will again be in phase with its field. The energy radiated from the reflector will then increase the energy radiated by the active antenna in the direction of the corresponding station. The energy rediated in the two directions of the plan of the network is extremely small, and the vectorial diagram of radiation of the aerial is unilateral and very sharp.

In the Chenju transmitting station are two such directional aerials suspended between three 60-meters steel masts. (Fig. 2.) One is made for the 26-meters wave and the other for the 16-meters wave.

These masts are equipped with outriggers permitting to bring the stays closed together within a very small area around the mast foot, and leave all the spare between them completely free for the antennas.

The Transmitting Station at Chenju

The transmitting station at Chenju, shown also on Fig. 2. contains the power supply plant and the transmitting plant.

The S.F.R. short-wave transmission system requires two different power supplies: an electric energy supply and a cold power supply of various kinds such as water, oil and air. All the engines providing these power supplies are installed in an independent building, separated from the building containing the transmitters, and in such a way that their mechanical vibrations cannot affect the latter.

The power-house consists of three separate compartments: a machine room with the Diesel generator, the switchboards and the rotary converters (Fig. 4.); an accumulator room, where all the power batteries of the oscillator and its regulators are assembled. (Fig. 5); and a cooling plant with motor-driven pumps installed in the basement (Fig. 6).

A 6,000-v. cable brings to Chenju from Shanghai the electrical power necessary to operate all the transmitters. Two transformers supply current to the American station. Two others supply the French station. The latter has, in addition, a complete emergency power plant, composed of a 75 kw. Diesel engine direct coupled with a 60 kw. alternator (Fig 7). By this arrangement the work of the French station will not be interrupted in case of trouble at the Shanghai power plant or leakage in the cable.

The power supply of the transmitting system comprises four distinct sources: (*a*) 10,000 D.C. volts for the water-cooled three-electrode valve plate; (*b*) 20 volts continuous current for the filament heating of the valves; (*c*) 400 volts and 160 volts continuous current for the voltage of the three-electrode valve plates of the regulator and of the control reception; (*d*) Six volts for the valve filaments.

All the batteries are duplicated in such a way that one lot can be charged whilst the others are working. The charge is made by means of rotary converter units fed by L.T. three-phase current (Fig. 8).

The pumping plant is provided for the cooling of the transmitting equipment. The transmitters are cooled in three different manners, by the use of *water*, *oil*, and *air* under pressure. Water is used for cooling the anodes of the valves. In each valve the heat energy produced may attain 3 to 4, 5 kws., this being removed by a circulation of 15-20 litres of water per minute.

Oil is employed for cooling the two iron-core self-induction coils in the oscillating circuit, whose function will be further described.

The heat energy loosed in this self-induction coil is about 1 kw., represented by copper and iron losses. The oil is circulated at the rate of 25-30 litres per minute.

Air under pressure at 300-400 grams is employed for the cooling of the different glass-metal joints of the three-electrode valves provided with water circulation, as well as the bulb joint between anode and glass at the output end of the grid, and the output ends of the filament.

The air is supplied directly by the blowing machine. The water and the oil are supplied from two respective tanks which are mounted at the highest points of the station. These tanks are automatically filled by motor-pump sets, and their capacity is such that they will in themselves supply sufficient water for the cooling of the transmitter for an hour or more.

The water and oil pumping machines will start automatically when the level in the oil and the water tanks reaches the lower level. A float sets off an automatic switch which makes or breaks two phases of the three-phased line supplying the motors.

Transmitter Plant

RECTIFYING EQUIPMENT.—To provide 10,000 volt of direct current necessary for the transmitting lamps a rectifying equipment is installed in the transmitting room (Fig. 9). The rectifica-

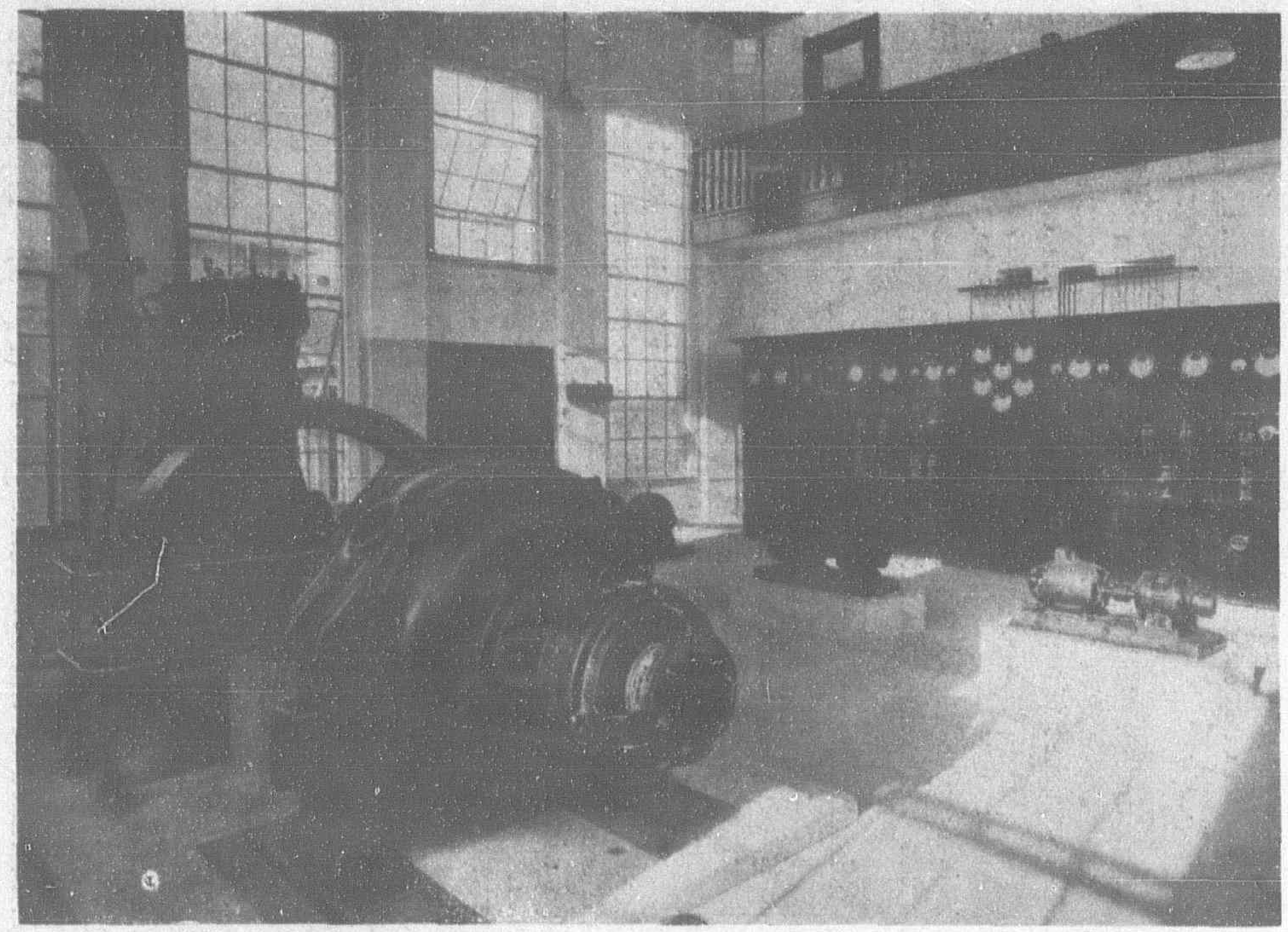


Fig. 4.—The Power Plant of the Transmitting Station at Chenju

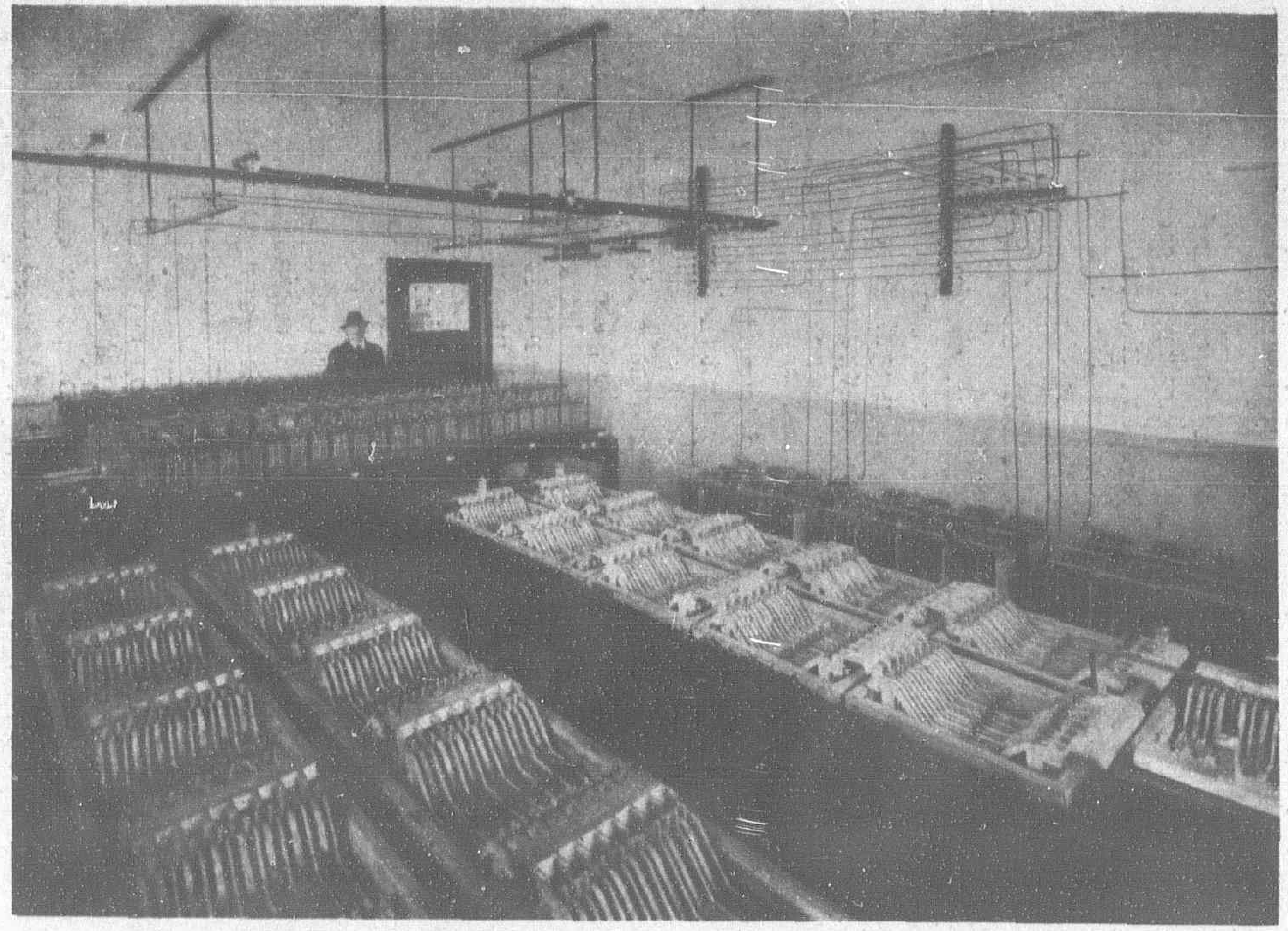


Fig. 5.—The Transmitting Station at Chenju. Storage Battery Room

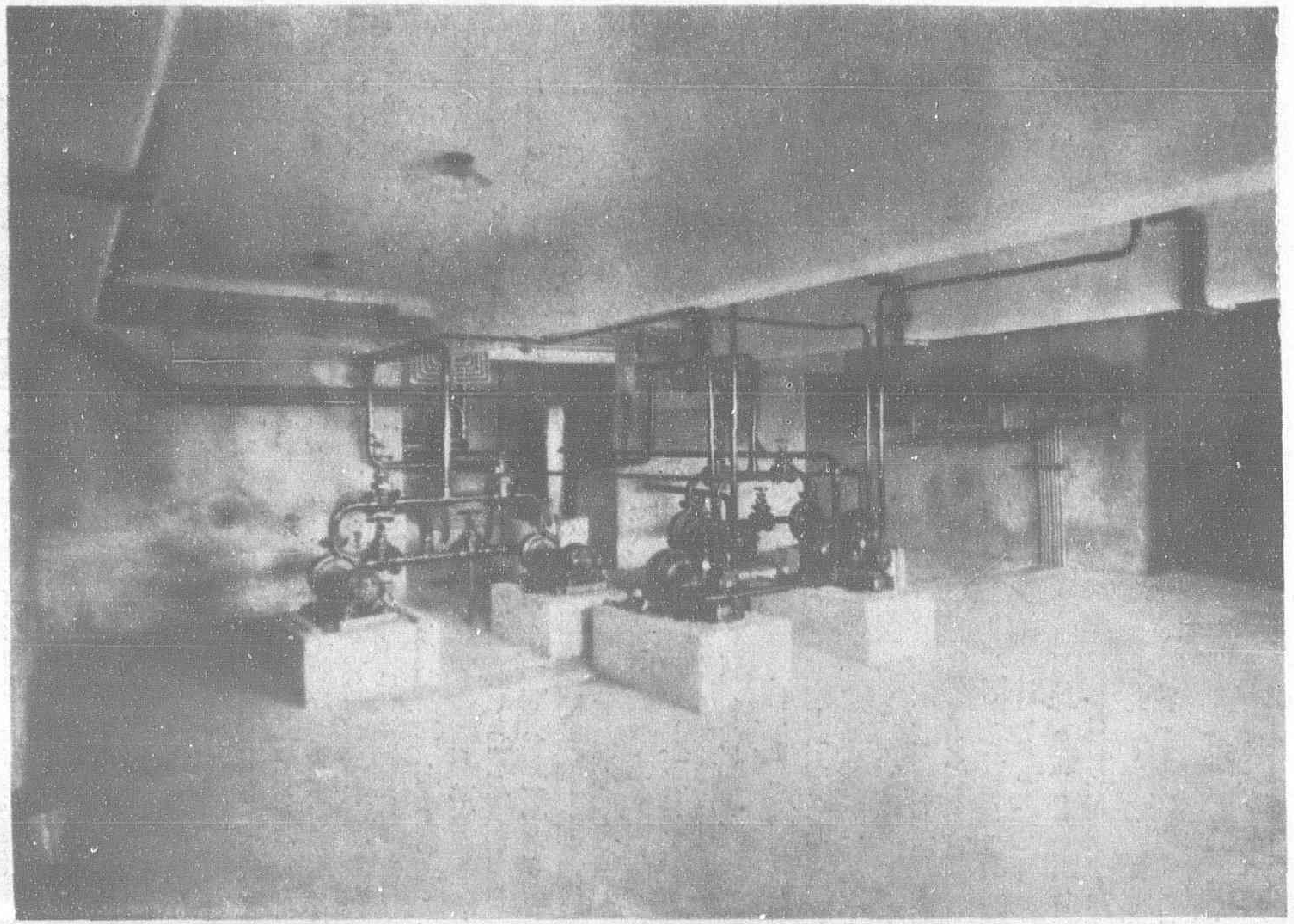


Fig. 6.—Transmitting Station at Chenju. Cooling Plant

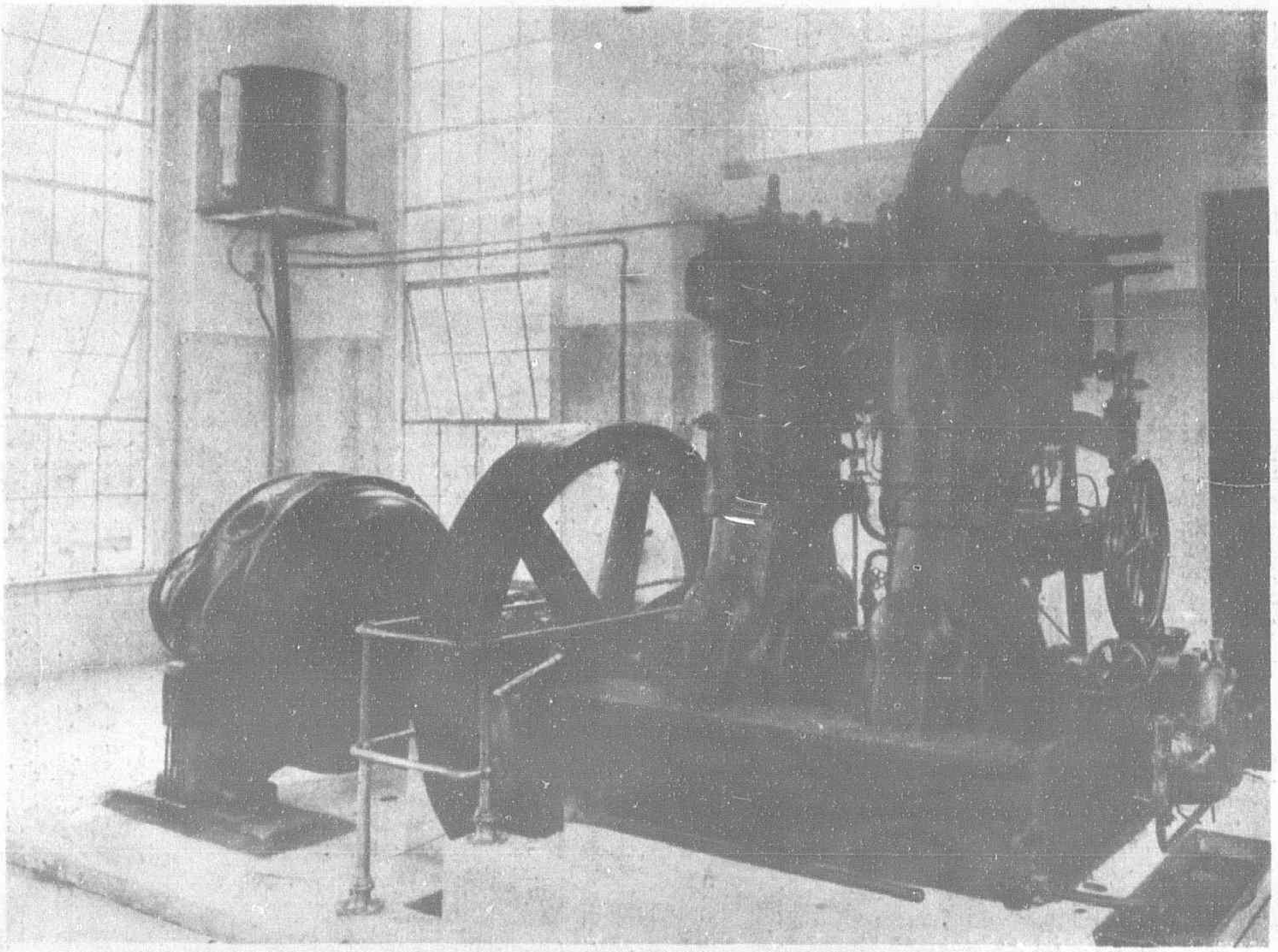


Fig. 7.—Transmitting Station at Chenju. Diesel Generator

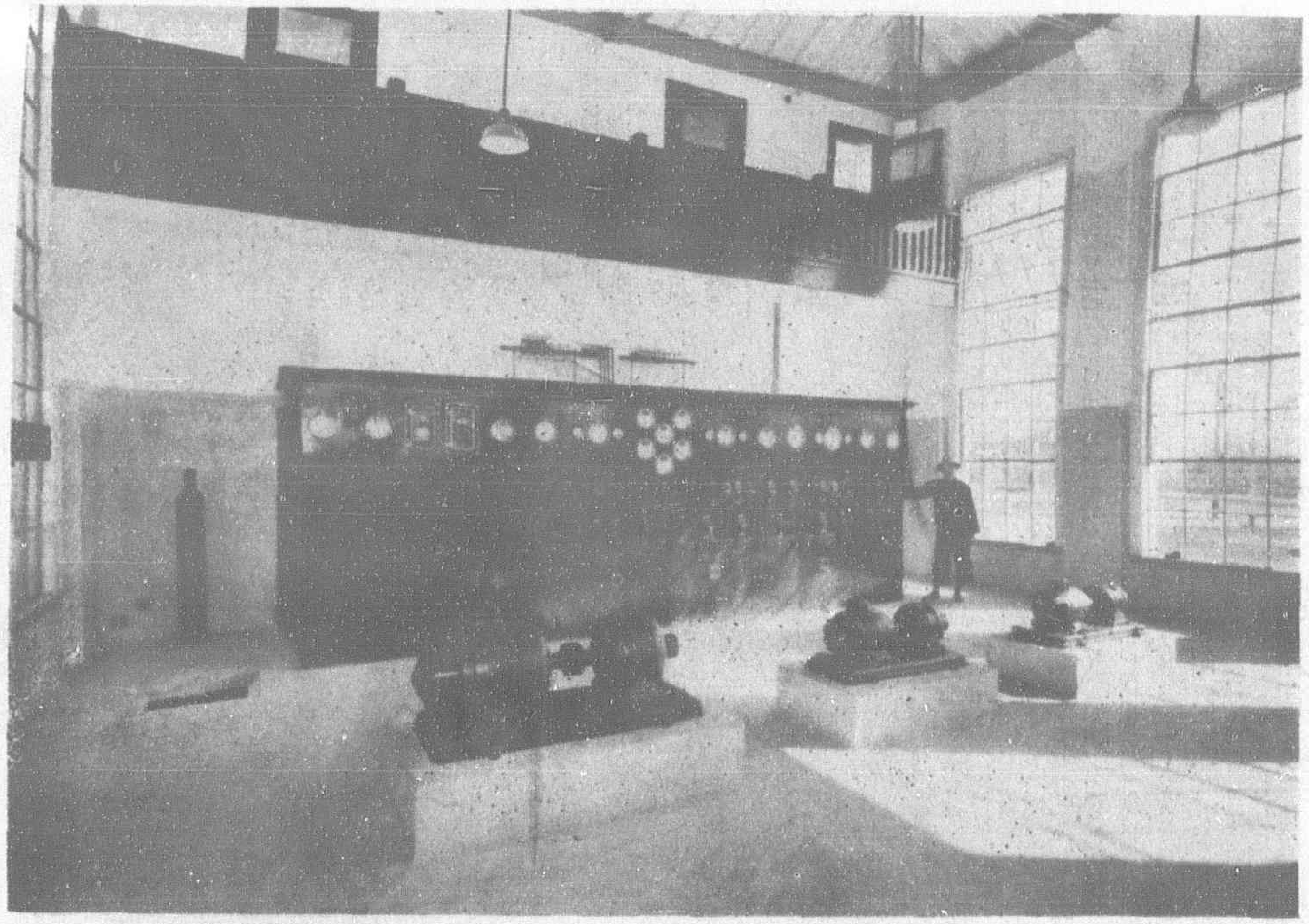


Fig. 8.—The Transmitting Station at Chenju. Main Switchboard and Charging Sets

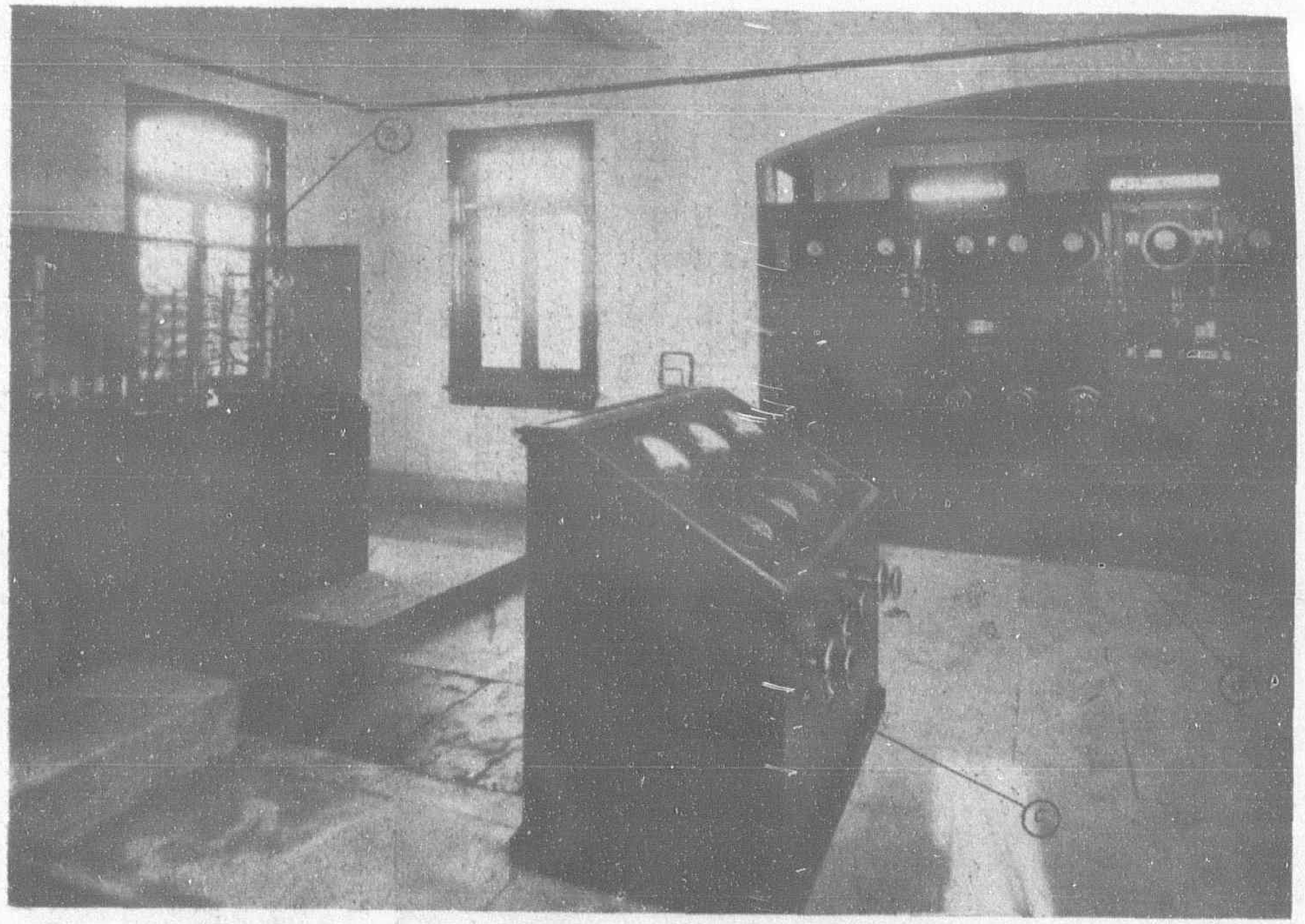


Fig. 9.—Transmitting Plant at Chenju: (a) Rectifying Equipment; (b) Double Transmitting Equipment; (c) Control Desk

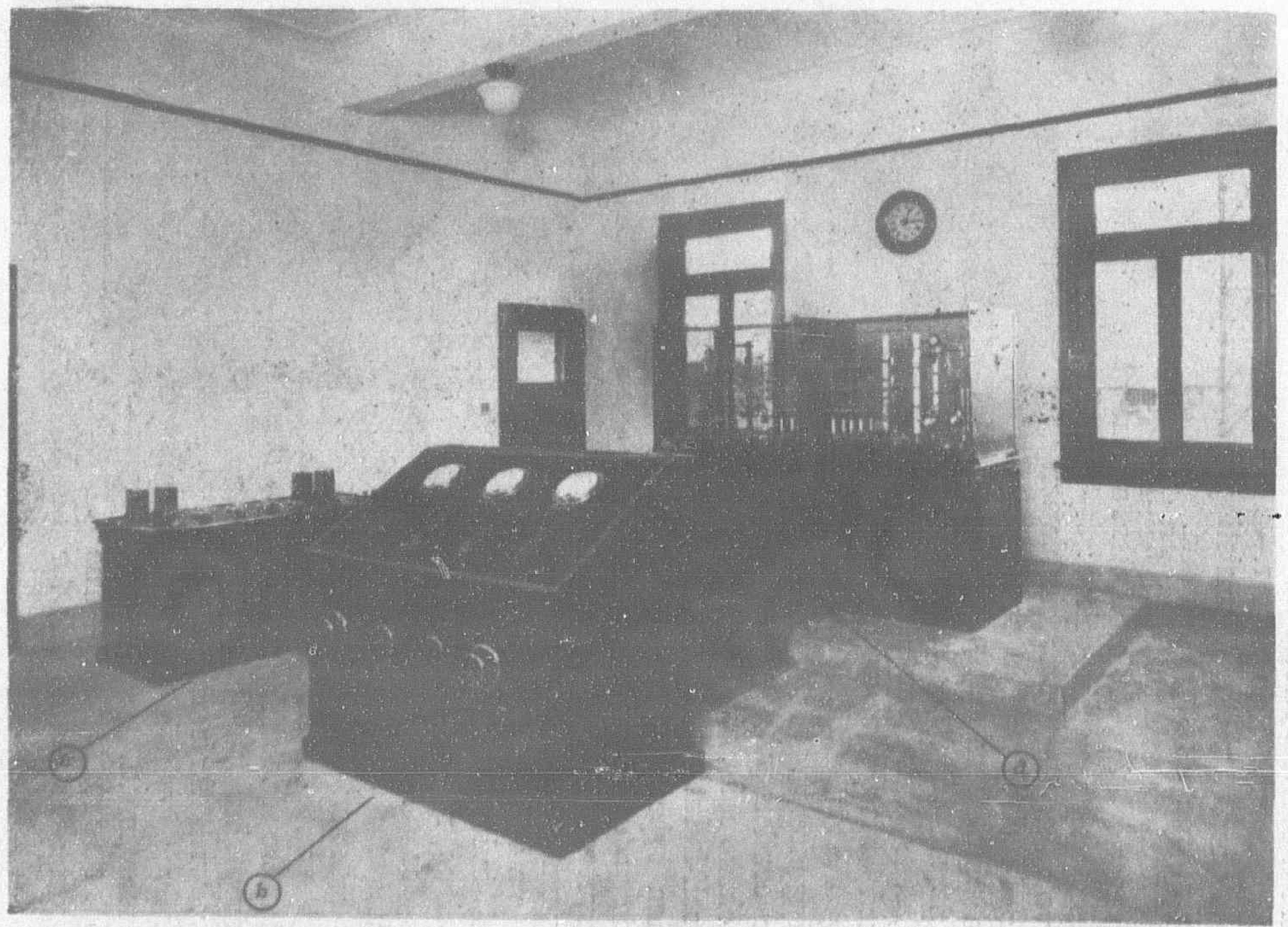


Fig. 10.—The Transmitting Station at Chenju. (a) Double Transmitting Equipment; (b) Control Desk; (c) Keying Table

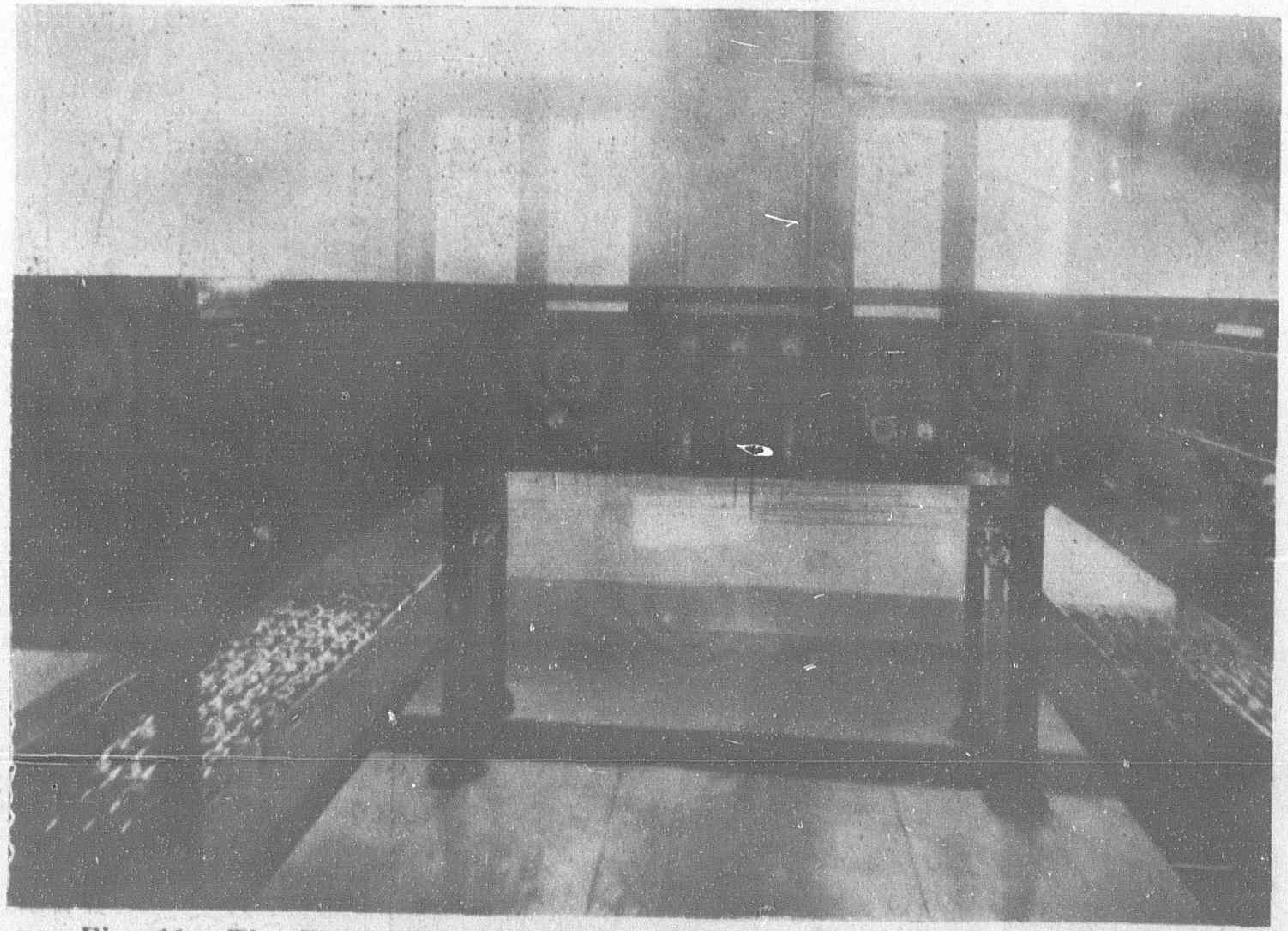


Fig. 11.—The Transmitting Station at Chenju. The Frequency Regulator

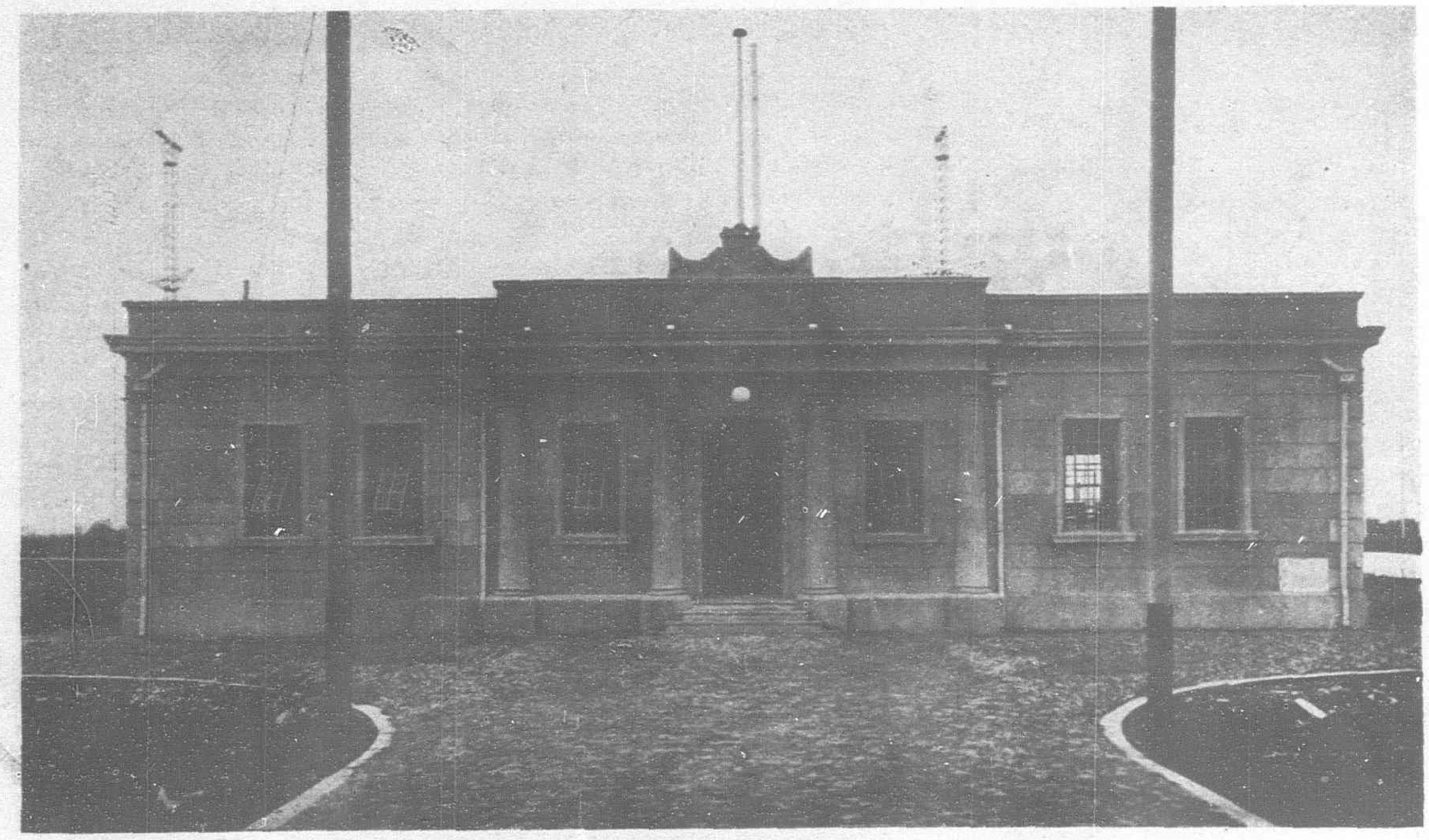


Fig. 12.—The Receiving Station at Liuhong. Main Building

tion is provided by 24 valves of nominal single unit power of 1 kilowatt. The power-supply of these valves is procured :

(*a*) By two three-phase transformers for heating the filaments.

(*b*) By two transformers, three-phased at the primary and six-phased at the secondary, providing the anode voltage.

An induction regulator on the high tension supply of the transformers can vary the rectified continuous current in the limits required for the various adjustments of the transmitter.

The rectifying circuit is protected against all excess of voltage by a circuit-breaker mounted in the supply circuit, but this latter becomes inoperative when the valves are short-circuited.

Various measuring instruments for observing the operation of the rectified current circuit are provided on the rectifier's panel.

TRANSMITTING EQUIPMENT.—This apparatus comprises two separate transmitters, each consisting of a valve provided with water circulation, and its supply outfit.

The double transmitting equipment comprises a cast-metal base, upon which the two oscillators are mounted (Fig. 10).

Each oscillator comprises :

A valve of the water circulation type.

A self-induction coil made of three parallel windings, two being parts of the heating circuits, the third one being connected with the grid and forming the induction of the oscillating circuit.

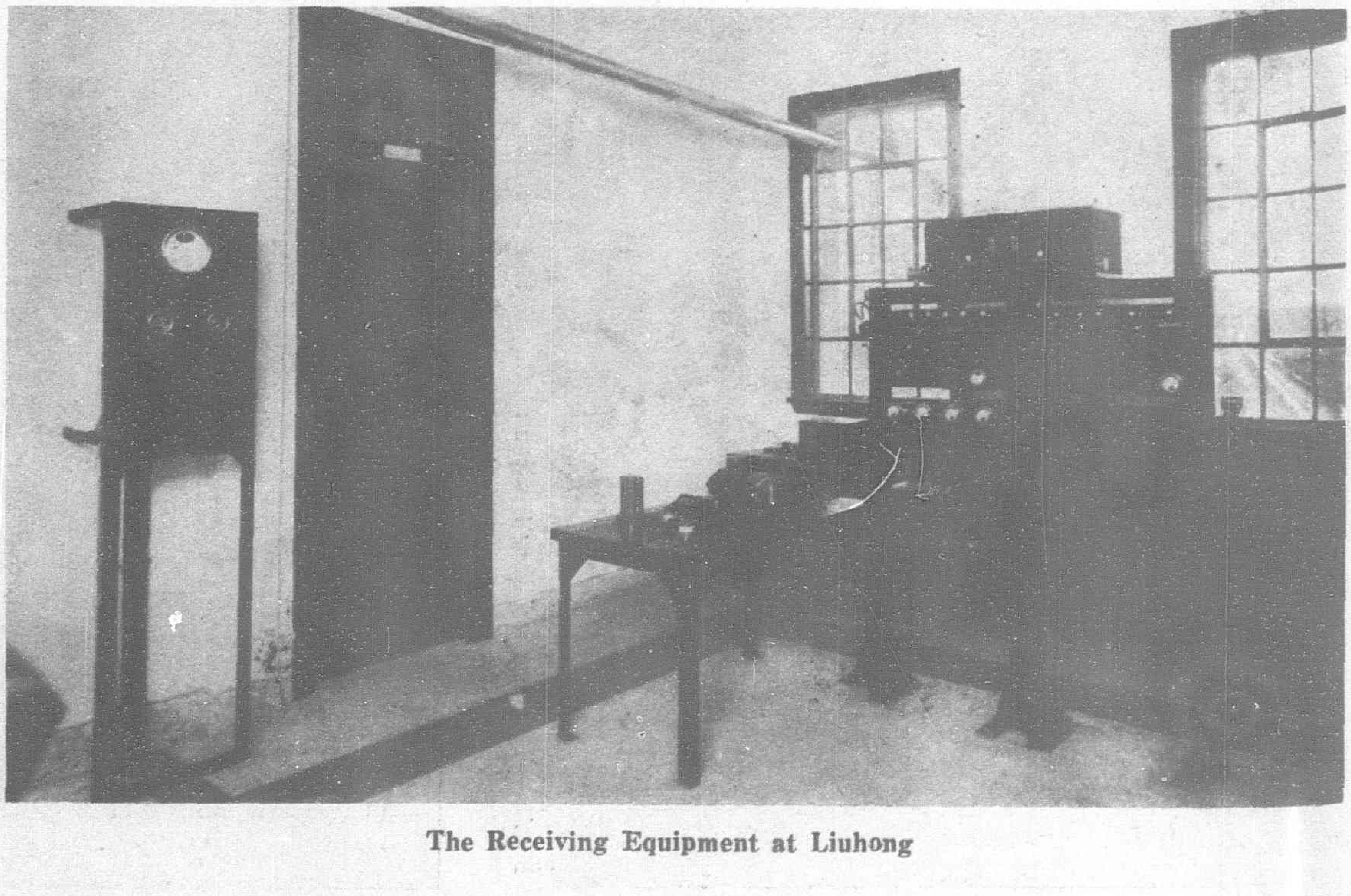
Air condensers, " grid leak units " choke coils, etc.

A self-induction coil of the saturation type and an electromagnetic condenser for the keying system and for regulating the frequency, these being connected to a suitable point of the triple self-induction coil.

Various measuring instruments for regulating and controlling the rate of oscillation as follows :—

In the base of the oscillator apparatus are placed the various pipes supplying the water, oil and air, with their cocks and safety-valves, which will be further mentioned.

CONTROL DESK.—The control desk is employed for the various handling of the transmission apparatus (Fig. 10).



The Receiving Equipment at Liuhong

After the water and oil circulation has been set up and then constantly maintained, and the rectifying valves are heated, the operator at the control desk can set the blowing apparatus in action, and can supply the heating current and then the plate current to one or both valves.

For this purpose it is provided with four switches. One switch closes the general circuit-breaker, so that the air-pump is set in operation.

The second and third switches close the circuit-breakers of the heating circuits of both valves and also close the circuit-breaker connected to the high-tension conductor leading to the anode of the valves. These operations can only be performed when the water circulation is normal.

Should the water circulation be stopped, the safety valve will break the 20-volt circuit supplying the circuit-breakers, so that these cannot be closed.

The fourth switch closes the circuit-breaker, which supplies three-phase current to the primaries of the voltage transformers used for the rectifying circuit. This circuit-breaker, whose supply circuit passes through the contacts of a safety valve placed on the oil piping, can only be closed when the oil is circulating.

In the case of an excess of current on the output end of the rectifying circuit, thus opening the electric switch operating on maximum current, or if the oil or the water circulation be stopped, the circuit-breaker will open, and the 20-volt circuit will ring an electric bell.

All these operations are fool-proof and automatic.

FREQUENCY REGULATOR.—One of the outstanding features of the French short-wave wireless equipment is the auto-regulation of frequency (Fig. 11). This system of regulation has many advantages over the so-called " crystal stabilizers," especially in the case of new circuits to be open, where the propagation conditions are not known. This was the case in Shanghai, where the " auto-regulation " system has proved to be very valuable, allowing to make tests with as many wave-lengths as are necessary, while with the crystal stabilizer the change of the wave-length is a very difficult and practically impossible task.

The principle of the auto-regulation is as follows :—

A small standard transmitter is regulated to a frequency which is slightly above the frequency of the main transmitter, so that if the frequency of the latter should tend to increase, the beats will have a lower frequency ; this reduces the saturating current of the iron core inductance, so that the self-induction is increased, thus increasing the apparent self-induction of the oscillating circuit, and the frequency of this circuit will thus be deminished.

KEYING TABLE.—The keying table (Fig. 10) is equipped to receive two sending lines of the central office, and is provided with two pairs of Baudot relays. On the table are also mounted various instruments for measuring the current in the saturating self-induction. The currents in the key circuits can be registered by the undulator. The signals are produced by changing the frequency of the transmitted waves, this change being effected by causing the Baudot relay to act upon the regulator.

The transmitted signals are observed or checked by the use of a receiver, which comprises a carefully arranged autodyne and a low-frequency amplifier with two valves, which actuates a loud-speaking device.

The Receiving Station at Liuhong

The receiving station installed at Liuhong (16 miles from Shanghai) contains a directed French beam aerial, supported by three steel masts 45 meters high, the receiving plant installed in the building (shown in Fig. 12) and the power plant for operating the station and for supplying the lighting current. The site for the receiving station has been chosen as far remote as possible from the industrial centers in order to prevent any interference of local electrical current. And for the same purpose the lighting of the whole site is assured by a powerful storage battery, as A.C. current is not suitable.

A separate remote building contains the charging equipment, with oil-engines, and all precautions have been taken in order to avoid parasite currents.

The purpose of a modern receiving station is not only to pick up the radio signals with are sent by the correspondent (Paris) automatically at a high speed, but to amplify and to transform these signals in such a way that the resultant current may be sent through the direct cable to the central office (situated at the Sassoon Building), where it may directly operate an automatic recording device, such as an undulator, or even a direct printing machine.

The Sociètè Francaise Radio-Electrique has pursued and attained this result by producing an entirely new reception set, which it is claimed is equal to the very best systems now actually in use.

It is a receiver with a double change of frequency, carrying a special device called a Fading Compensator, the object of which is to render the power of the received signals very constant, despite the effects of " fading" or of variations in the wave-length, and consequently to ensure a regular reception of fast signals whilst achieving an absolutely correct registration. This outfit enables a reception of all waves of between 12 and 50 meters. The reception, comprises six boxes, supported by the same metallic frame, thus grouping all the amplifying and tuning instruments.

Each box contains respectively (Fig. 13)

Box No. 1 :—A short-wave resonating amplifier with a scale of from 12 to 50 meters, and a frequency-changer, bringing the frequency to about 750 kilocycles.

Box No. 2 :—A two-step band H. F. amplifier for 750 kilocycles, and a second frequency-changer bringing back the frequency to about 25 kilocycles.

Box No. 3 :—A two-step band H.F. amplifier for 25 kilocycles, and a detector.

Box No. 4 :—A D.C. three-step amplifier, an and anti-fading regulator.

Box No. 5 :—The switchboard for distribution and for adjusting the power, feed voltages.

Box No. 6 :—The different polarization batteries.

The signals collected by the aerial and transmitted by means of the coupling box are first of all selected by the aid of a resonator tuned on the incidental frequency. This resonator is coupled on the one part to the aerial and on the other to the first double-grid valve frequency changer. In this double-grid valve the frequency of the short wave is transformed into a first intermediary frequency of about 750 kilocycles.

This result is obtained by connecting the interior grid of the double-grid valve to a heterodyne, the characteristics of which are selected for that purpose, whilst the external grid is connected to the preceding resonator.

All arrangements are made for obviating detrimental reactions between the H. F. resonator and the heterodyne circuit.

The signals on the first intermediary frequency are finally amplified in a two step filter amplifier. A second frequency change is then effected like the first by means of a second double-grid valve and a second heterodyne chosen in such a fashion as to obtain a second intermediary frequency of about 25 kilocycles. The signals are then amplified again in a two step filter amplifier and then rectified.

The maximum amplification possible is about 10,000. Its instantaneous value is regulated by a subduing device (which we describe farther on) which automatically counterbalances the fading effect.

This device is controlled by the action of the detector placed behind the filter amplifier of Box No. 3, and the action of which is increased by a three step amplifier of the direct current type. This apparatus on the one hand controls the anti-fading device, and on the other hand gives the telegraphic signals the requisite value for a correct registration.

In the case of telephony it amplifies the modulation without deformation, whilst the mean value of the rectified and amplified carrying-wave does not practically vary.

In order that the operators may be able to follow with their head phones the continuous waves in telegraphy a special device is arranged in the first box, which by its working enables the incidental waves to be modulated to one audio-frequency.

The intensity variations due to fading can be automatically corrected. The anti-fading device varies the receiver's sensitiveness by acting on the polarization of two of the grid circuits of the second intermediary frequency amplifier. The corresponding valves consequently work in the regions more or less inclined to their characteristics. The fitting-up is done in such a way that if the telegraphic signal has a tendency to fade, and consequently if the mean value of the detected current has a tendency to augment the polarization tension, then the second intermediary frequency amplifier's grids vary in such a manner as to increase the total amplification of that second intermediary frequency until it re-establishes the desired value of current in the recorder.

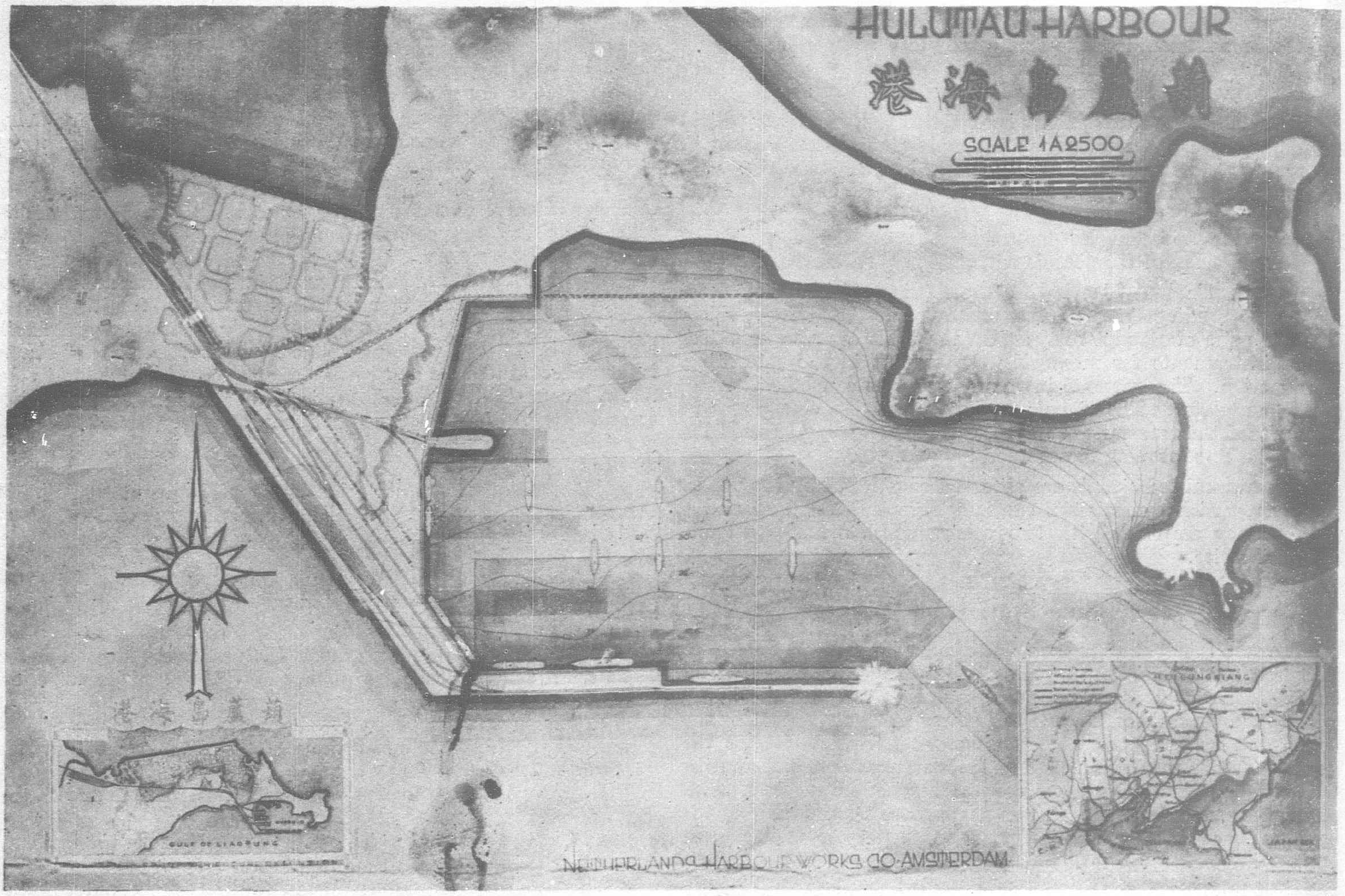
United American Bosch Corporation

The new United American Bosch Corporation joins the Robert Bosch Magneto Company, Inc., with the American Bosch Magneto Corporation in one organization which will better serve various industries with its many products, and make available a more extensive sales and service organization.

The United American Bosch Corporation, in addition to the products of its own manufacture will become the exclusive sales outlet in American territory for all products of Robert Bosch, A. G. of Stuttgart, Germany.

The aim and interests of both companies were identical. The products of each have won wide favor for their excellence of performance. There are many advantages to customers of both companies through the consolidation of effort and concentration of endeavor made possible by this united organization.

The officers of the United American Bosch Corporation are Arthur T. Murray, President ; Morris Metcalf, Vice-President and Treasurer ; Louis Beeh, G. J. Lang, Leon W. Rosenthal, Hermann Waker, J. E. Wild, Vice-Presidents ; R. W. Washburn, Secretary and Assistant Treasurer. As in the past, the general offices of the Corporation will be at the main plant in Springfield, Massachusetts, with branches in New York, Chicago, Detroit and San Francisco.

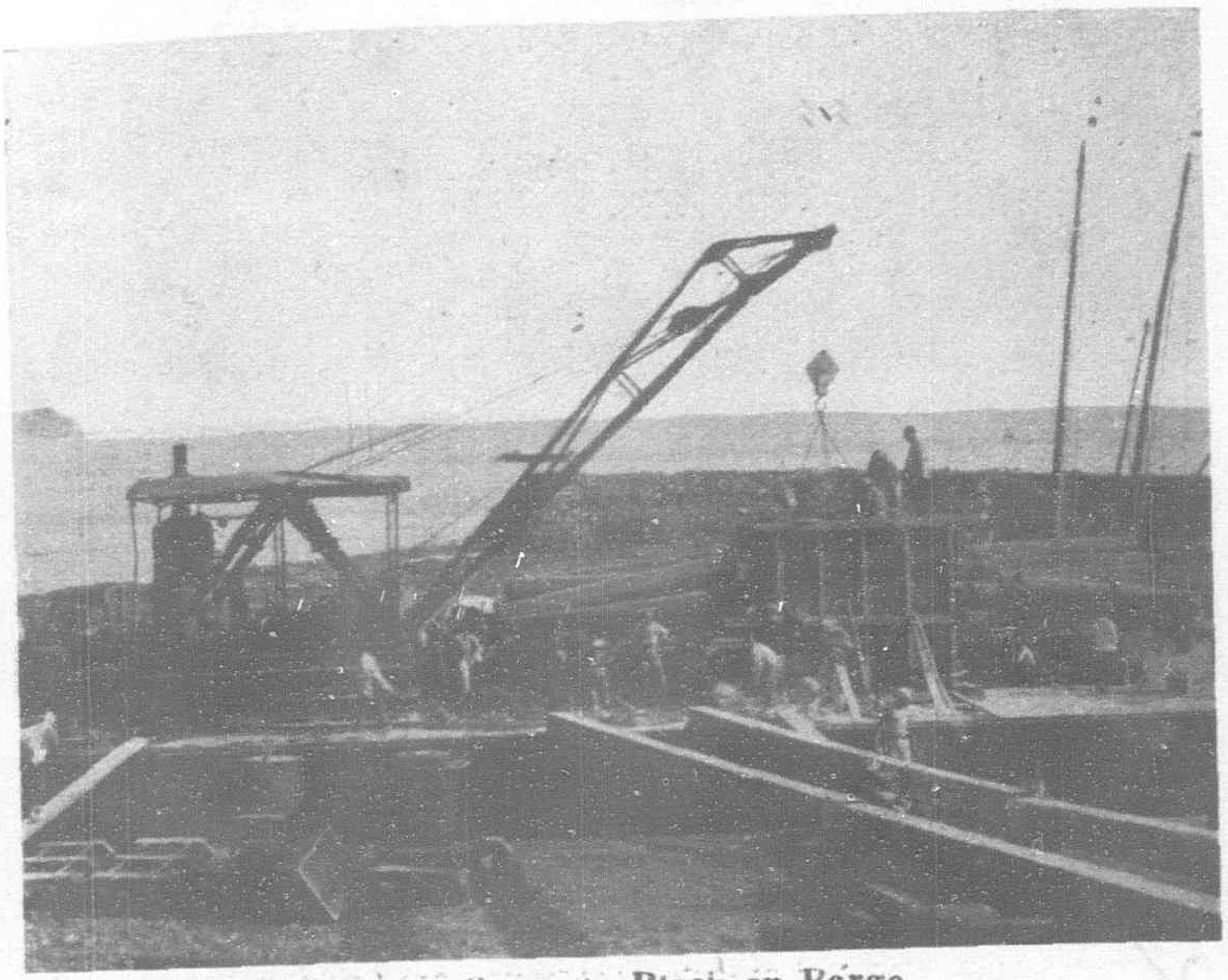


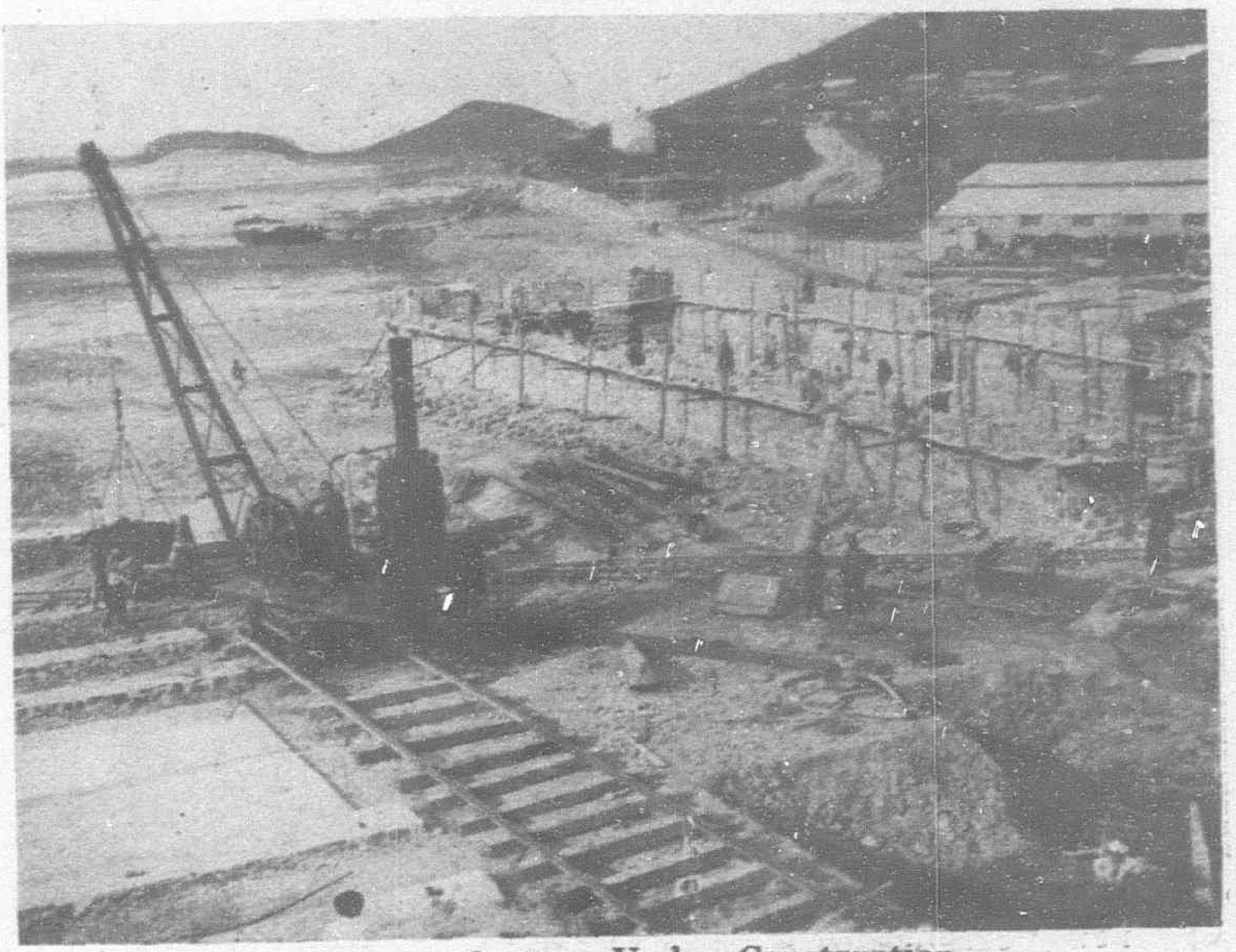
The Port of Hulutao

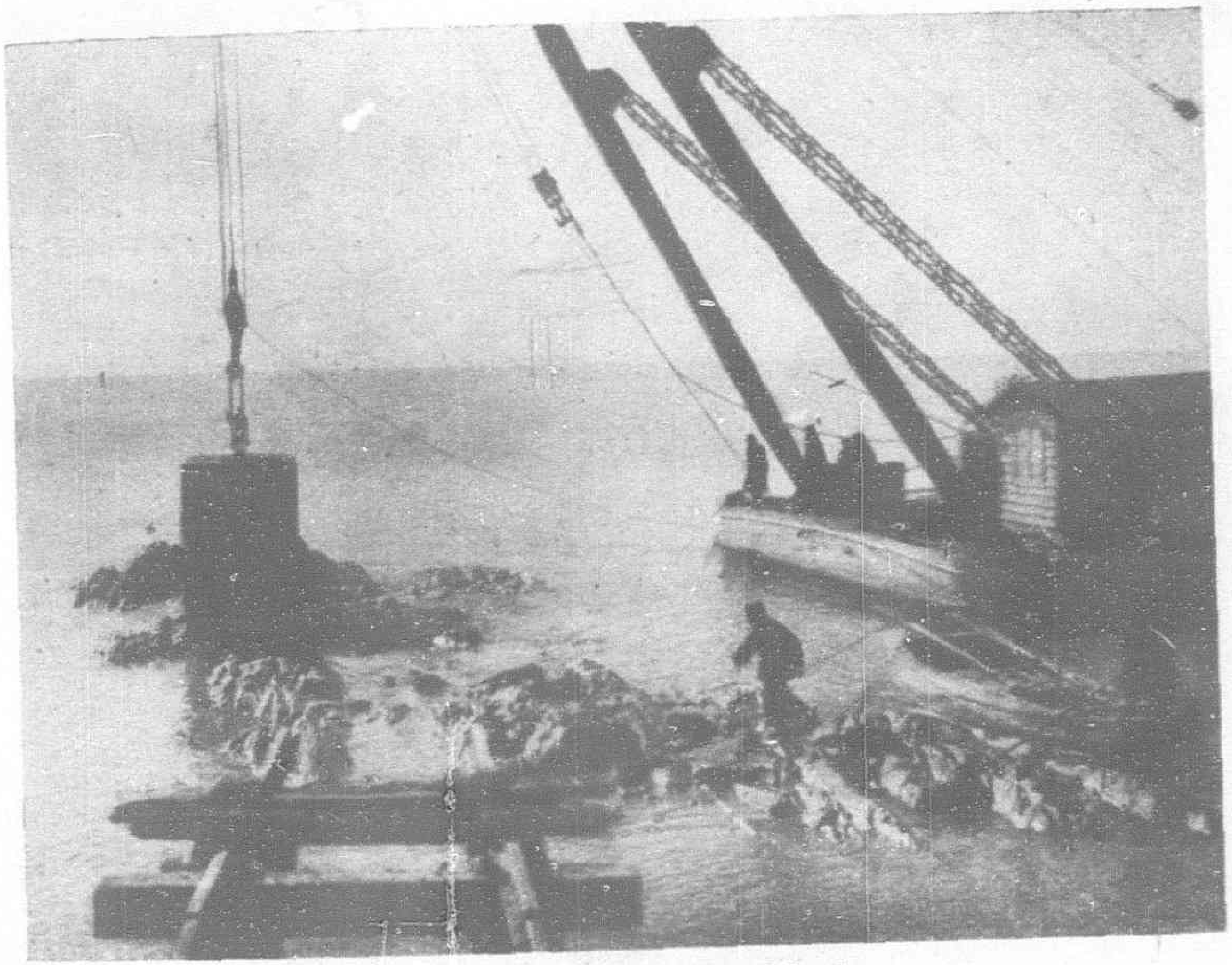
The port of Hulutao is situated at latitude 40° 45′ N. and longitude 121° E. on the northern shore of the Gulf of Pechili. It is reached by rail on the Peiping-Liaoning Railway at the station Lienshan, connected with the port by a branch line about 7.5 miles in length. It is ice free throughout the winter and does not have wind storms during the summer. Just opposite the harbor there are a few islands, which serve as a sort of screen and afford protection. Its geographical location is also excellent for the development of Manchuria. The harbor together with the branch line furnishes an outlet for the coal produced by the Pehpiao Coal Mining Company. A little further north-east on the Peiping-Liaoning Railway is the station Tahushan which is connected with Tungliaochen by a branch line of 252.30 KM. in length. Tungliaochen is a very important grain center in the Province of Fengtien and has lately been connected with Liaoyuan, a station on the Szepingkai-Taonan Railway, a line of 428.54 KM. in length. Taonan is connected with Tsitsihar, the capital of Heilungkiang Province, and a railway between Tsitsihar and Aigun and Taheiho on the northern border of the Heilungkiang Province, is to be constructed.

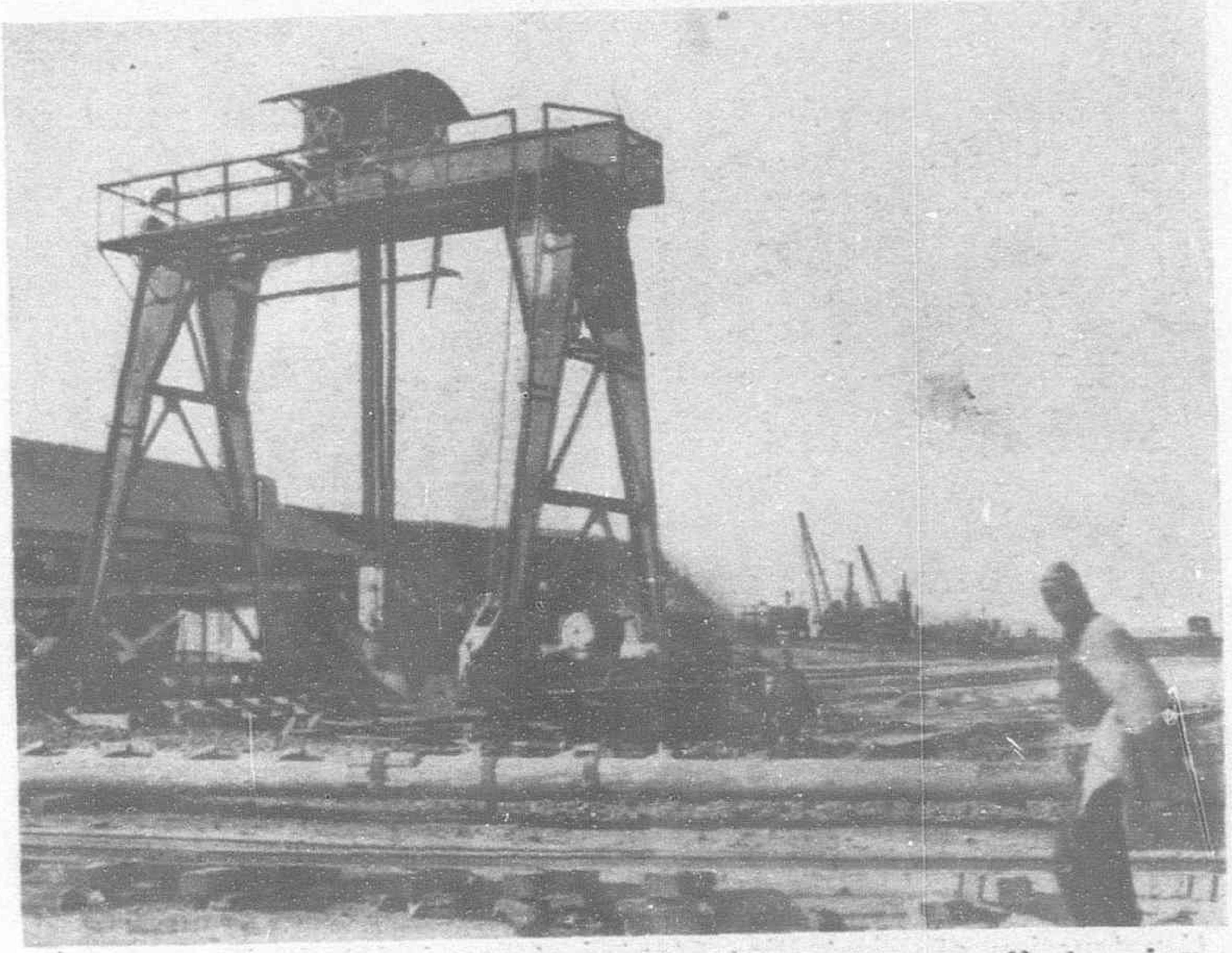
When Hsu Shih-chang, later president of the Republic of China, was Viceroy of Manchuria with the progressive Tong Shao-yi as governor of Mukden, in the year 1908, a British engineer, Mr. W. R. Hughes, was engaged by the Manchurian authorities to investigate and to select a suitable place for a commercial harbor, and Hulutao was chosen as the most suitable location. During the following year, when the construction of the Aigun-Chinchow Railway was proposed, it was the intention to have the port of Hulutao as its deep water terminal. The Manchurian authorities appointed Huang Kai-wen, then industrial taotai of Mukden, as director and Mr. Hughes as engineer to build the port and construction work was started in the spring of the following year. The branch line between Lienshan and the port was constructed, a large office building was erected, the breakwater was started and sheds for workmen were constructed. Then the revolution came and the work had to be stopped after having spent about one million and two hundred thousand dollars. A second attempt to construct the harbor was started during 1916, for the purpose of creating a port to ship away the coal from one of the coal mines near Chinchow. It was again proposed in 1918 to build the port with a loan from European and American capitalists, but it did not materialize. However as a result of this agitation the Manchurian authorities decided to allocate $5,000,000 and instructed the Peking-Mukden Railway authorities to allocate $5,000,000 from the surplus earnings of the railway, making a total of $10,000,000 to be devoted for the construction of the Port of Hulutao. In the following year Chow Sao-hsiang was appointed director general for the construction. But owing to civil war and other reasons, the project died after a very short life. When Chang Yin-hwei was director of the Peking-Mukden Railway and concurrently Vice-Minister of Communications, the project was again revived and negotiations were started with the Netherlands Harbor Works Company, represented in China by the Netherlands Syndicate for China, whose representative was Mr. Robert de Vos, for a contract in lump sum to build the harbor. After lengthy negotiations, a draft agreement was finally drawn up but on account of political developments the scheme was again shelved. With General Kao Chi-yi as director of Peiping-Liaoning Railway, the project for the construction of the port of Hulutao was again brought to the front and negotiations with the Netherlands Harbor Works Company were resumed. This time the project was definitely and finally concluded by the signing of an agreement at Tientsin on January 24, 1930, between General Kao Chi-yi, director of the Peiping-Liaoning Railway Administration, representing the

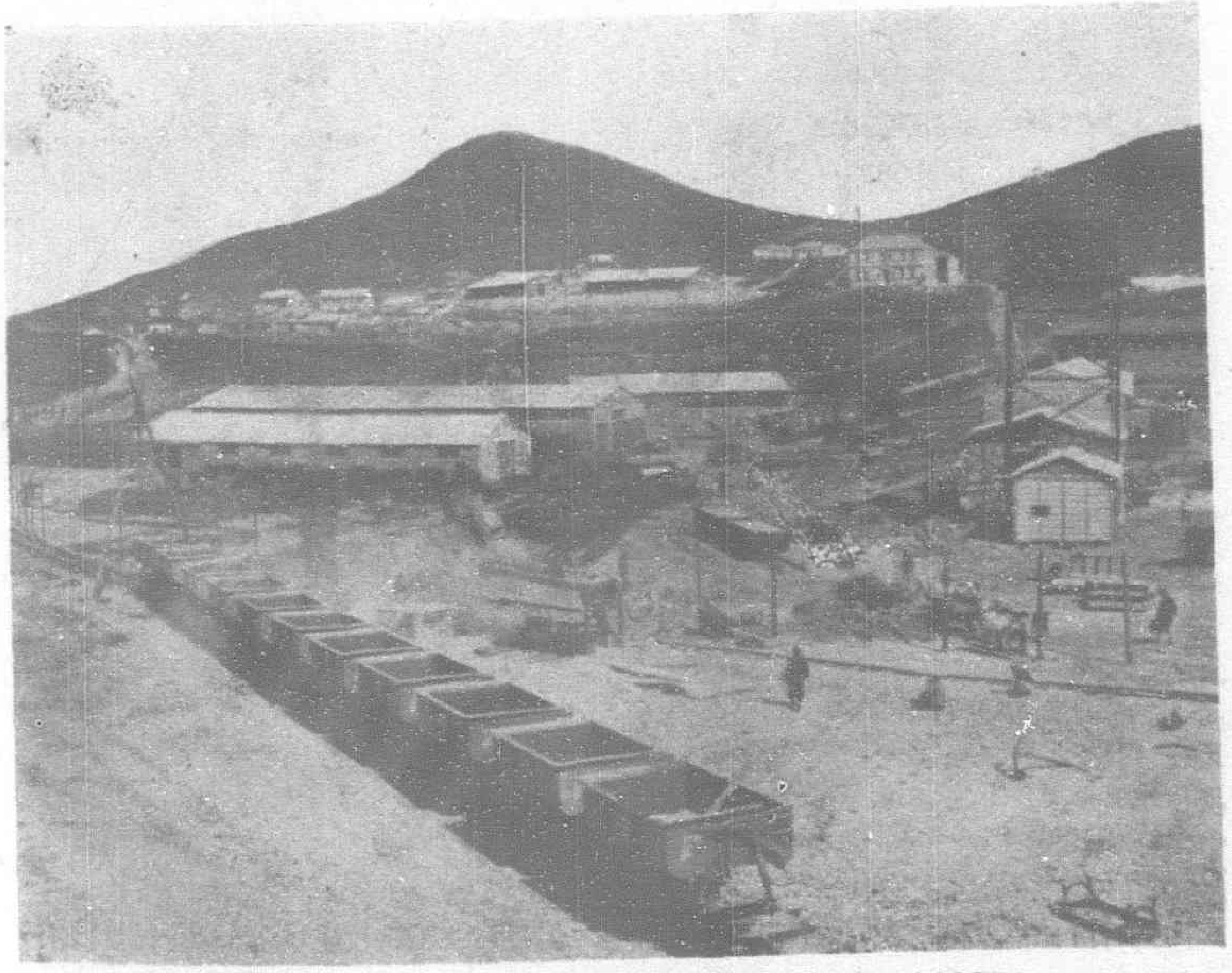
Administration, under the instruction of the Ministry of Railways of the Republic of China and the supervision of the Northeastern Commission of Communications and Mr. Robert de Vos representing he Netherlands Harbor Works Company for China. A formal pening celebrating the start of construction work for the Port f Hulutao occurred on July 2, 1930.

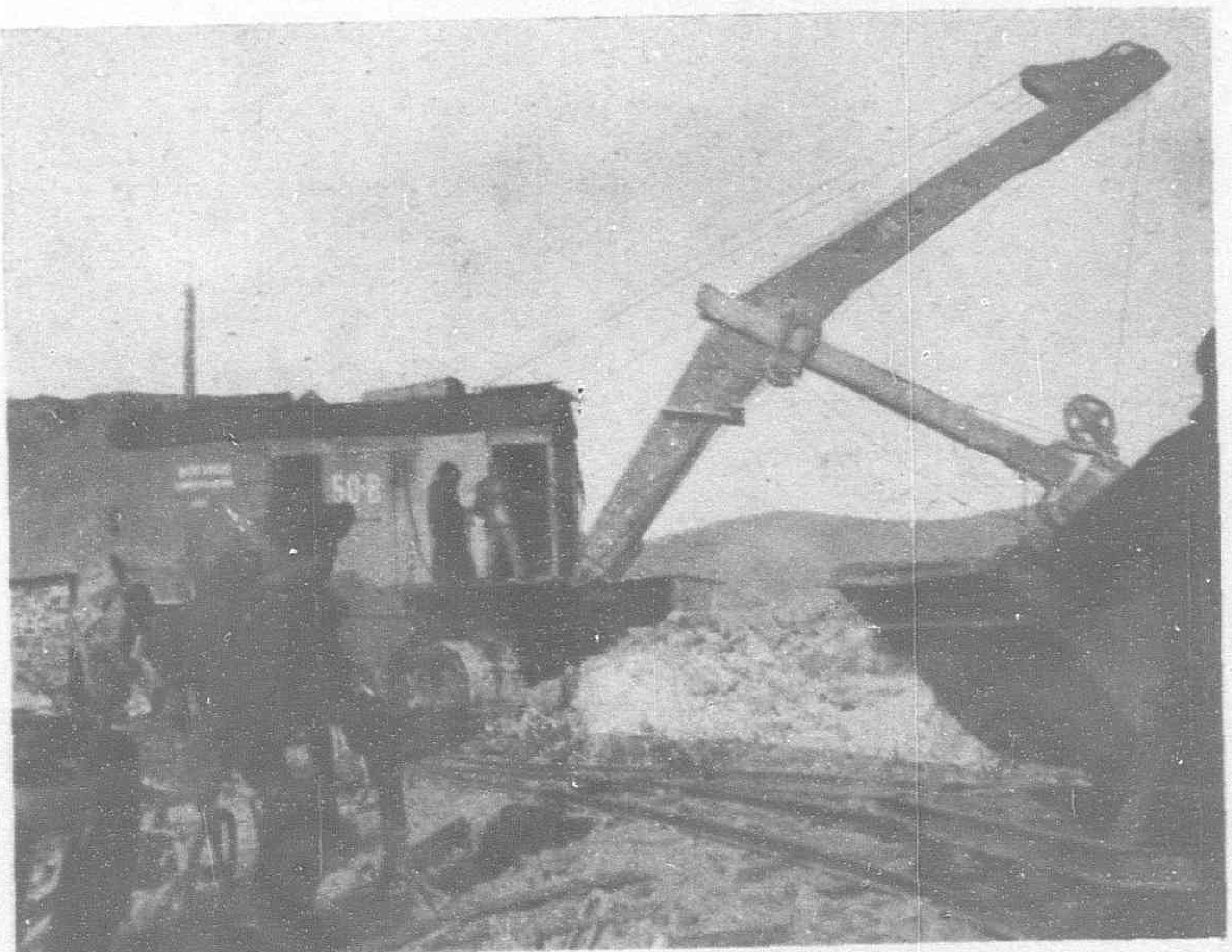

Casting Concrete Block on Barge


Concrete-factory Under Construction

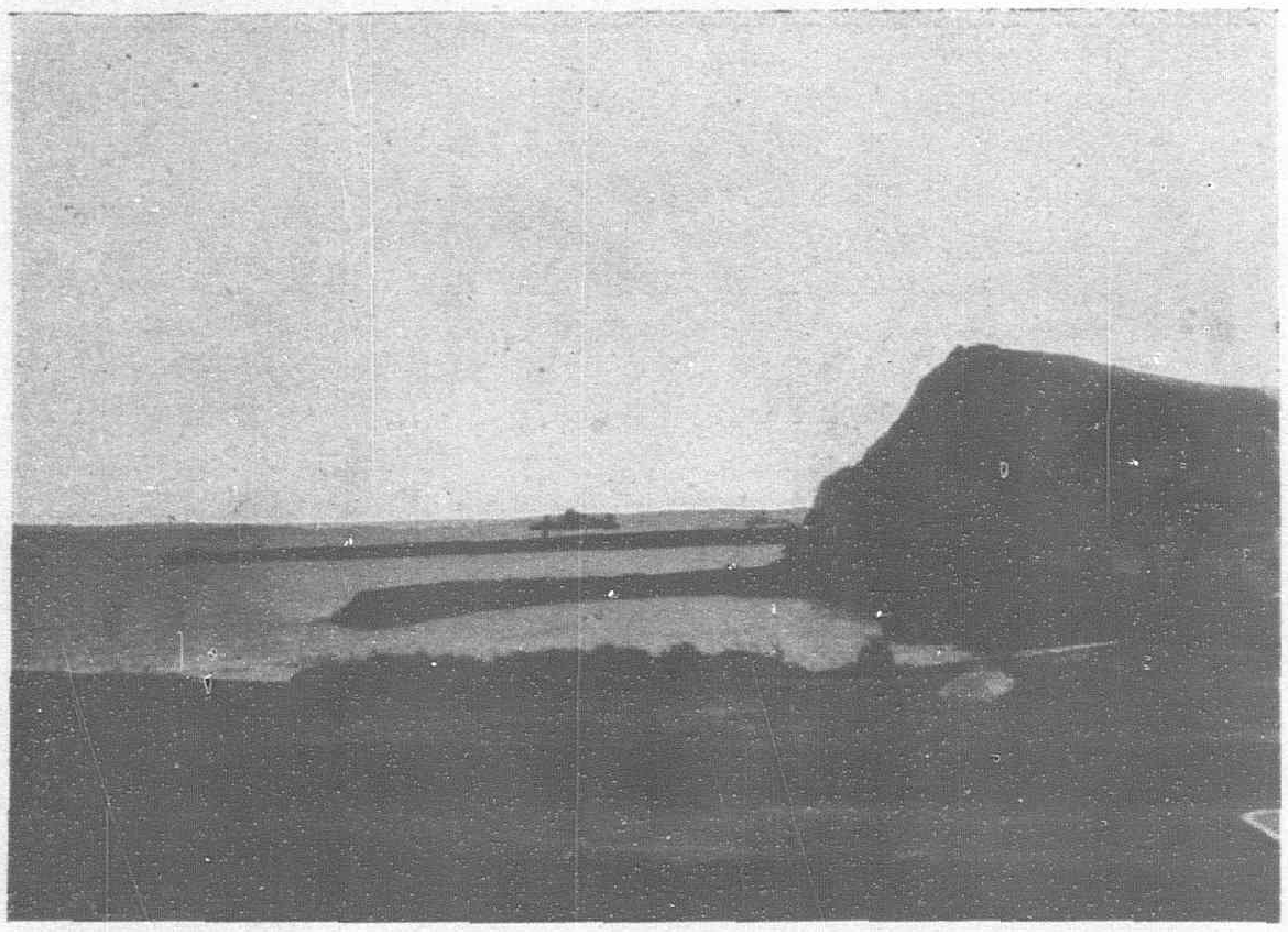

Lowering of the first block


Portal Crane for Lifting 60-tons Blocks and jibcranes discharging material


Workyard and Staff-quarters, October 1930


Bucyrus Motorshovel Excavating Rock

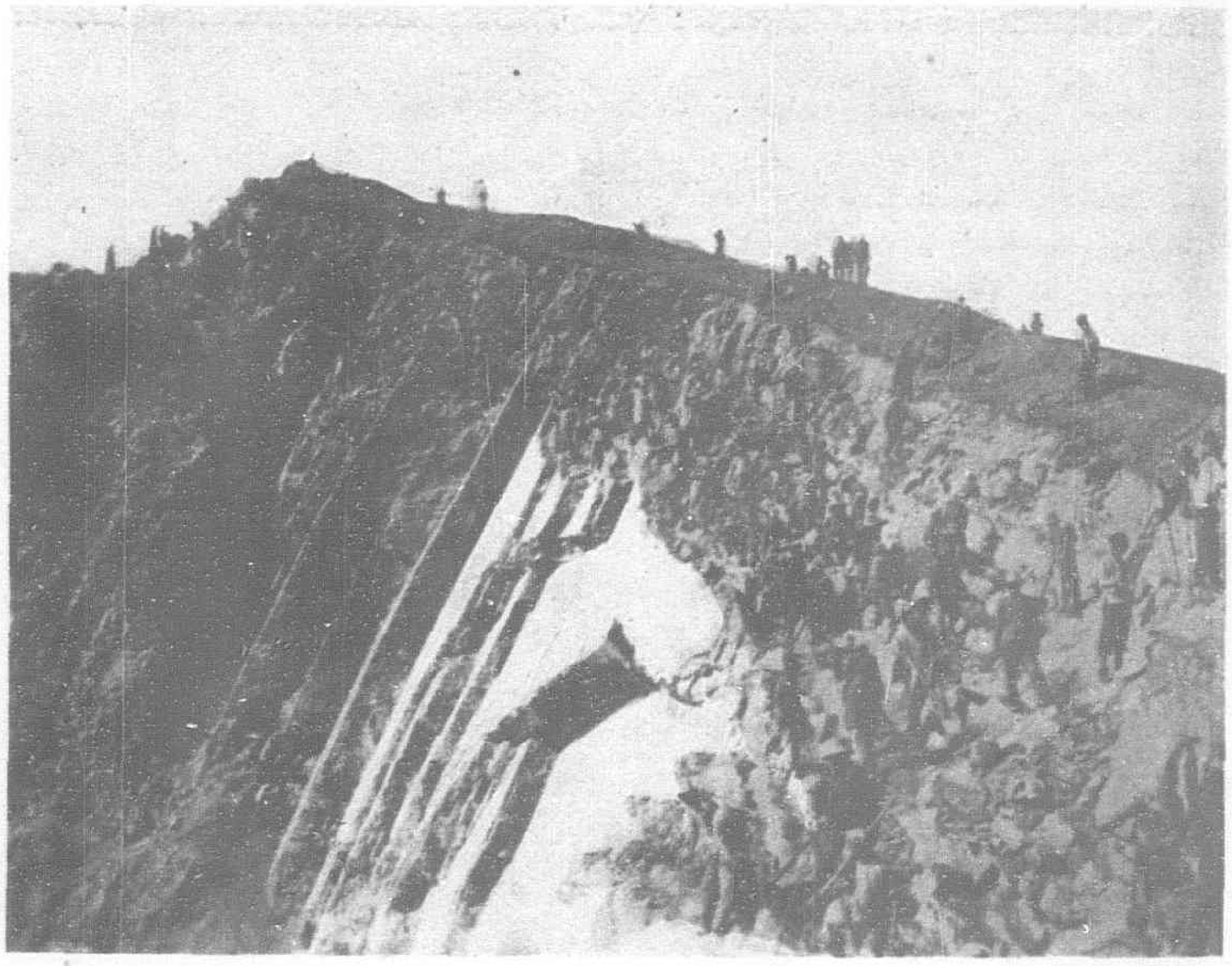
The contract calls for the completion of the work before October 15, 1935, that is five and one half years after the signature of the agreement at a cost of U.S. $6,400,000 to be paid out of the surplus earnings of the Peiping-Liaoning Railway in installments. When the harbor is finished together with other port facilities, ocean steamers drawing 35 feet of water may moor alongside of



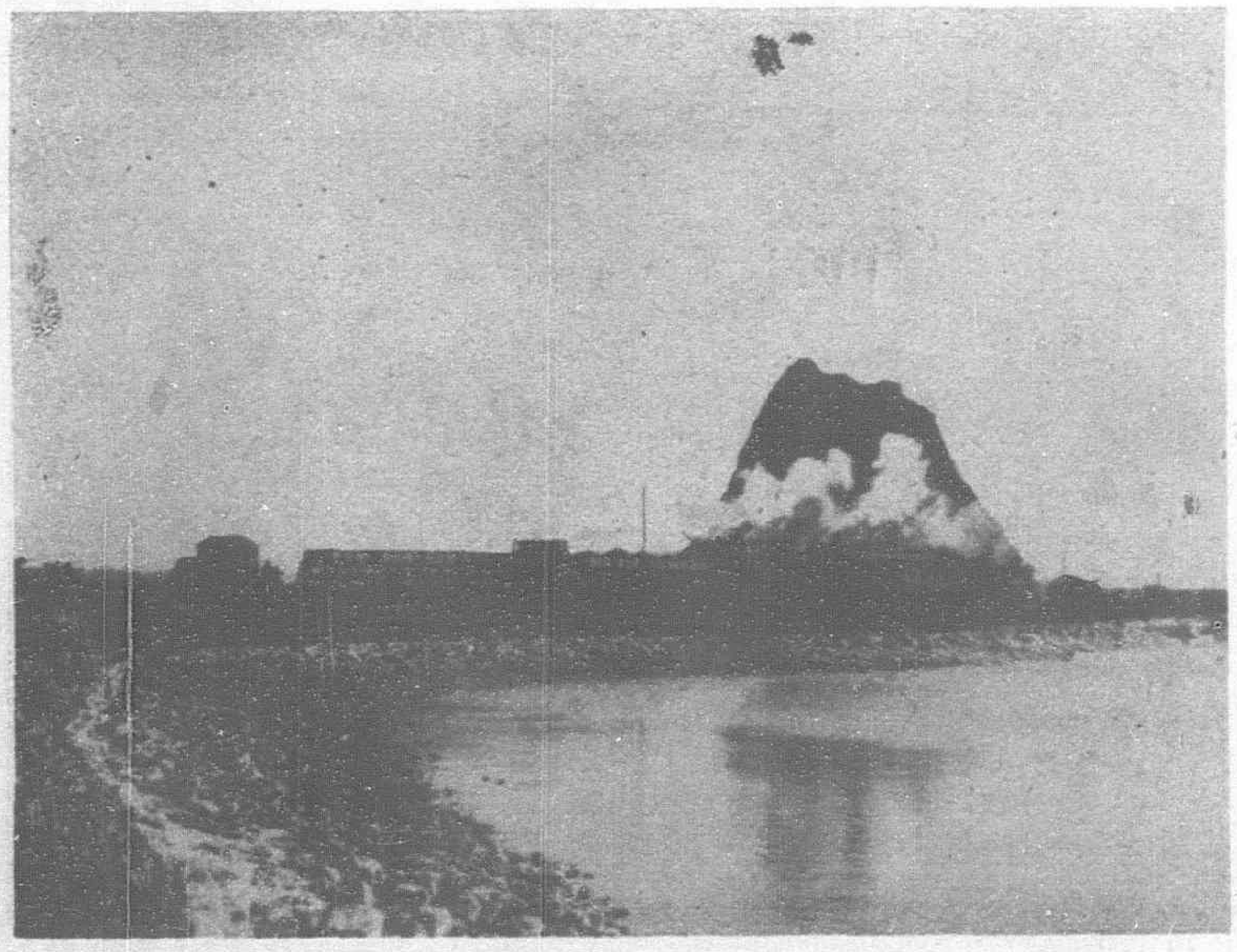
1 Bucket-Dredger Dredging Foundation trench breakwater with newly constructed piers in foreground. November 1930

Bucket-Dredger at Work. Pier, under construction projecting to the right. November 1930 2

3 Construction of First Pier Started. (May 1930) In Foreground Projecting to Left

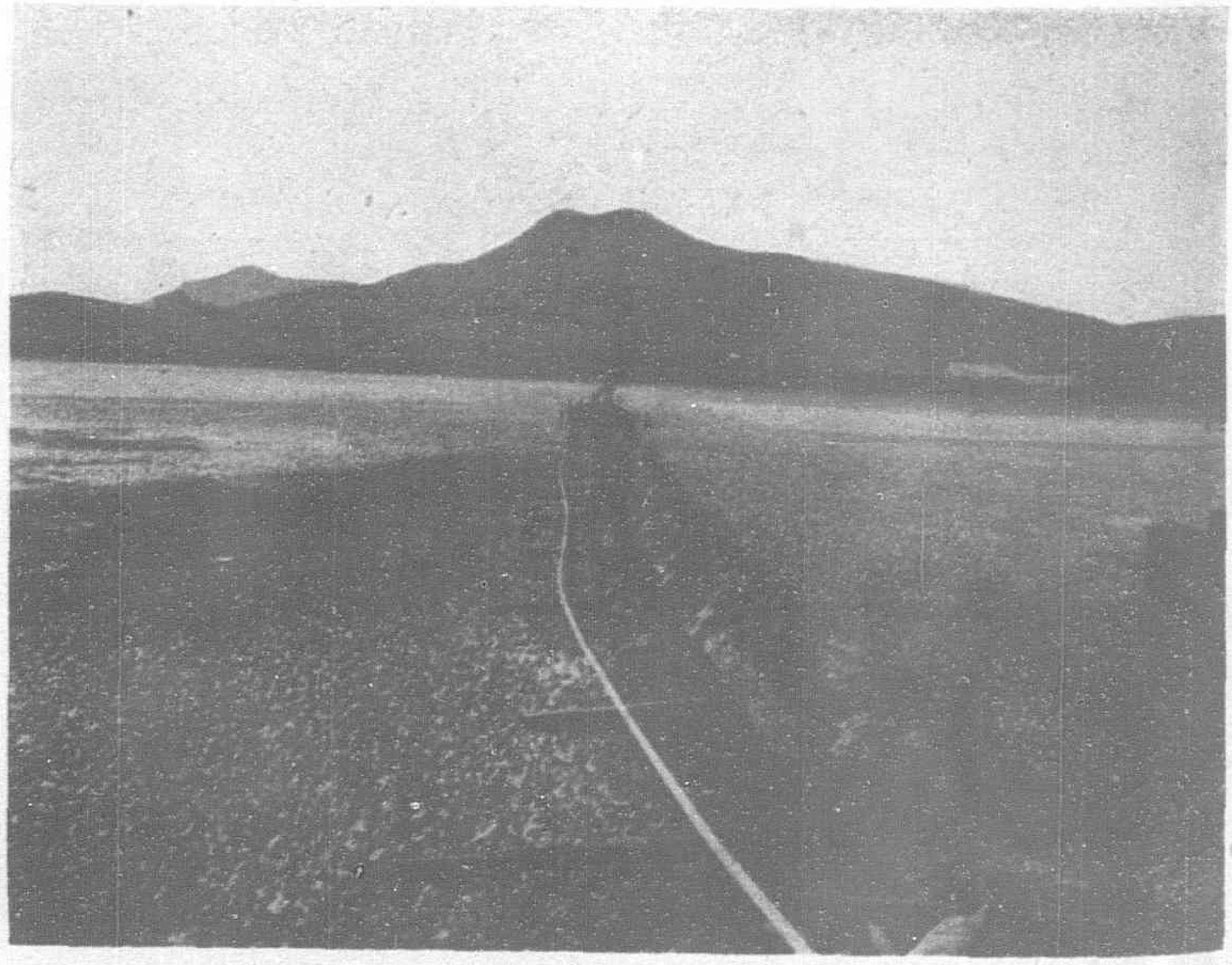


4 Excavation by Hand



Excavation by Means of Machinery, Transportation by Trains

5



Laying of Water-Main Across Mud Flat

6

the wharf at low tide. The port will eventually be equipped with wharf frontages of concrete measuring about 3,700 ft., with a breakwater measuring about 5,100 ft. and with a quaywall of about 7,900 ft. in length, besides other port facilities, such as light, water, hospital, hotels and good roads which the officer in charge of city planning is now making plans to provide. To supervise this great undertaking, the Peiping-Liaoning Railway has created a department of harbor constructions, headed by Mr. Pan, a French returned student, who is also in charge of the development of the city of Hulutao.

The total quantity of stone work required for foundations of quaywall, breakwater, backfillings for quaywall and breakwater, retaining dike, construction pier, etc., will be approximately 1,080,000 cubic yards, which are to be obtained from the Tung Shan and Pan La Shan quarries, which are equipped with air compressor installations, jackhammers and other accessories, and the total amount of excavation will be about 800,000 cubic yards. Concrete blocks required for breakwater, for quaywall, for superstructure of breakwater and quaywall and for retaining dike, etc., will approximately measure about 312,700 cubic yards and in order to construct these blocks by the latest methods, extensive machinery for the manufacturing of concrete blocks have been installed, consisting of one stone crusher with a capacity of crushing about 15 cubic yards of stone per hour, sieve installations, concrete mixer, concrete placing tower of 130 ft. in height, with hoisting winch capable of hoisting 20 cubic yards per hour together with wooden trestles, necessary tracks and tipping waggons. The amount of dredging work required will amount to about 3,600,000 cubic yards and one of the best equipped floating plants is now in operation on the spot.

Since last spring thousands of coolies mostly from Hopei and Shantung provinces and skilled workmen and mechanics principally from the southern provinces have been employed on the job. The hills are covered with people looking at a distance like ants crawling all over the place. At night the port is lighted with electricity produced by a powerful installation of 1,050 k.w. capacity. New office building and quarters for both Chinese and foreign staff are dotted here and there at different parts of the hills together with buildings in construction. Steam locomotives, travelling cranes, dredgers, barges, tugboats, steamshovels and pumping stations are already busy at work so that at the appointed date the contractors will be able to hand over the port to the authorities with the various work as specified in the agreement as completed.

Features of the contract are :—5,000-ft. of breakwater ; 3,700-ft. of quaywall ; 300 acres of sheltered anchorage ; 3,000,000 cu. yds. of dredging ; 150 acres of reclamation.

In order to finish the whole job by 1935, considering the limited number of workable days, it has been carefully prepared and organized. Machinery must be used extensively, providing for a safety margin in the supply of power and of construction materials, as delay in one department of the work would impair progress in other departments. Much time and energy has been devoted during the first season to preliminary operations, to assure uninterrupted progress later on.

The first concern of the contractors was to provide living quarters for the Chinese and foreign staff and for the large number of laborers to be employed.

A dozen brick houses with all modern conveniences were built on the east and south slopes and spacious barracks on the northeast slope. In addition, the following buildings have been erected :

Hospital with 60 beds meeting all modern requirements, located on a small plateau and commanding a fine view.
Company's Offices (floor area over 3,000 sq. ft.)
Power Station, near the shore partially on reclaimed land (floor area over 6,000 sq. ft.)
General Store (area over 7,000 sq. ft.) containing several months' stock of 2,000 different articles.
Special Store for spare parts of machinery (area over 3,000 sq. ft.)
Mechanical Workshop (ground plan area about 8,000 sq. ft.) well equipped as most repairs are urgent and must be effected locally.
Carpenters Shop (area about 4,000 sq. ft. close to the mechanical workshop as both works are being operated in close co-operation.
Locomotives Shed and Repairshop (area 5,500 sq. ft.)
Two Cement Godowns (areas 5,500 and 6,600 sq. ft.) close to the concrete block making yard.

The problem of water-supply was not easy to solve. Numerous wells were dug within a radius of several miles from the works and the construction of dams across the valleys to gather rain water in reservoirs as tried by Mr. Hughes twenty years ago was considered, but sufficient quantities of water could not thus be secured. Therefore, the two miles of main pipe which were laid to a pumping station in the Western Hills will be extended next spring another three miles to the river. The trench digging for laying the pipes in what is called the " mudflat " (covered by the sea twice a day and to be reclaimed later) proved a difficult task.

Stone and Sand Supply for Concrete : Stone of excellent quality for the manufacture of concrete blocks has been found on the north side of the peninsula. A three feet gauge railway one mile long, has been constructed, along the west slopes of the promontory from the stone quarry to the works. Along this railway about 600 cu. yds. of stone can be transported daily to the blockyard whereas about 500 cu. yds. daily will be carried by sea in self-tipping barges and deposited into the foundation trenches of quaywalls and breakwaters. Sand is obtained from the beach south of Hulutao and transported by means of junks and lighters.

Power : In the course of the first months, steam engines had to be used, but will be replaced by turbo-generator sets for which, the Babcock & Wilcox boilers, already installed in the 1,050 k.w. power station, will supply the steam. During the season 1930 four *tows* arrived at Hulutao with the Company's floating plant and other equipment from South China. This floating plant consists of : a bucket dredger (capacity 100,000—150,000 cy monthly), a sixty tons floating crane, four tugs, seven hopper barges, seven deck barges and self-discharging stone barges and several smaller craft.

These tows left Macao and Hongkong at intervals and owing to adverse weather three out of the four voyages were extremely difficult ; one tow had to call at Amoy and Shanghai for repairs, another tow lost a barge during a strong gale, which vessel was subsequently saved practically undamaged, thanks to the skill of the captain in charge.

As frequent sudden changes in the weather conditions occur at Hulutao, and shelter is not easily reached, the handling of the floating plant is extremely difficult and requires watchfulness day and night.

Besides the plant and equipment brought from South China by the company's fleet, large supplies of Chinese and foreign origin have been sent to Hulutao ; timber from Antung, cement from Tangshan, coal from Chinwangtao and Peiping and bricks and other building materials from Chinwangtao and Tientsin.

Furthermore : Seven steam cranes, five locomotives of 60-160 h.p. 30 self-tipping $5m^3$. Krupp steel cars for stone transportation, a Bucyrus motor shovel, capacity one cu. yd., and two steam-shovels of German origin and of similar capacity, reached Hulutao during the first season.

About 2,000 tons of miscellaneous cargo, including engines for the power station and a large consignment of oregon pine, arrived at Hulutao by sea, shipped direct from Europe and the Pacific Coast.

The goods were unloaded into the Company's lighters, which after reaching shelter were discharged by means of steam cranes and hand labor. Another 2,000 tons of miscellaneous goods such as stores, spare parts, timber and other building material, arrived by rail from Tientsin and Chinwangtao.

Labor : During the season about 3,000 laborers, mostly from Hopei Province, were working under the supervision of 25 engineers and overseers of Chinese and foreign nationality.

Excavation : Actual work was started early in April with the excavation of two hills, mostly by human labor assisted by compressed air for drilling holes. The tunnelling method was also successfully applied and in November of last year a Bucyrus motor-shovel shipped from the Canary Islands where the Company is building the port of Las Palmas, arrived and could still do a lot of work before too severe frosts set in.

Both hills are rapidly vanishing, while the reclaimed area increases. This excavation work may have to be slackened in order to keep sufficient valuable rock material in store as back-filling of quaywalls.

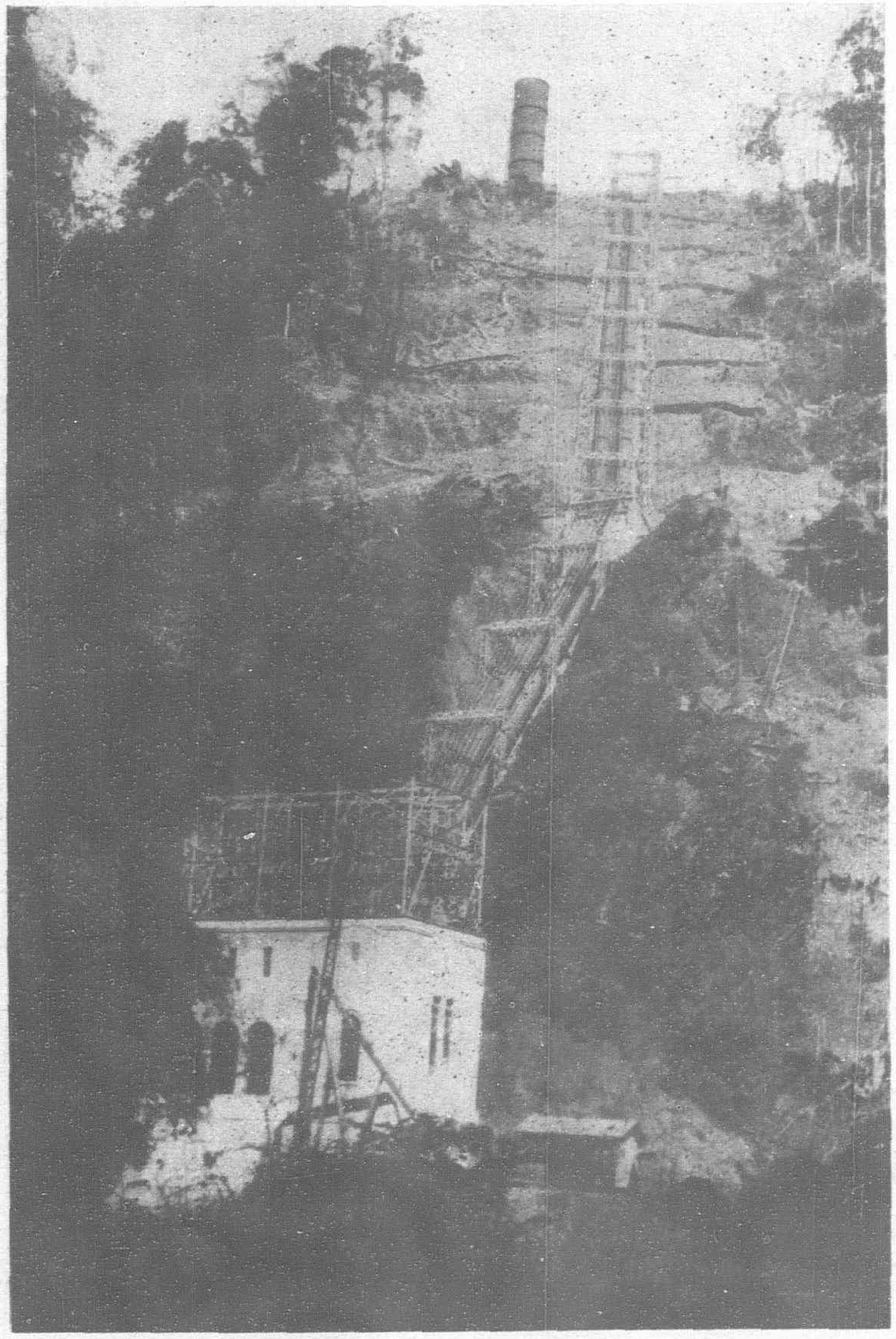
Approximately 300,000 cu. yds. have been used for reclamation purposes, covering about 23 acres. The remainder of the total area to be reclaimed under the harbor construction contract will

(Continued on page 198).

The Botocan Hydro-Electric Plant

The possibilities for the growth of a light and power industry in the Far East under private initiative without undue governmental restrictions are seen in the steady advance made by the Manila Electric Company in the creation of a system which supplies the capital city and chief industrial center of the Philippine Islands and some twenty-eight other municipalities on the Island of Luzon. In 1925, the Manila Electric Company was absorbed by the Associated Gas and Electric Company of New York, one of the most powerful financial groups in the United States, operating public utilities in territories having a population of nearly 60,000,000. Half of the State of New York and the whole of Staten Island are supplied by gas and electricity by this corporation. In New Jersey, Eastern Maine, New Hampshire, South Carolina, Florida, Louisiana, Kentucky, Ohio, Indiana, Illinois, Missouri, Tennessee, Arkansas, West Virginia, Delaware, Maryland, Connecticut, Nova Scotia and New Brunswick are found public utility plants operated by the Associated System. In addition to the Manila plant, the company operates plants at Dagupan, San Jose, Camiling, Tarlag, Capan, Baliuag, Calumpit, Hagony, Meycawyan, Obando, Pasig, Cavite, Bacor, Lucban, Atimonan, Gumaca, Lopez, Unisan, Naga, Oas, Ligao, Guinobatan, Gubat and Irosin.

Since the Manila Company became a part of the Associated System, the main Manila power plant has been increased in capacity by the installation of a 12,500 k.w. turbo-generating set and the building of the 15,000 k.w. hydro-electric plant at Botocan Falls. The power lines of the Manila Electric Company extend as far as Balinag in the north and Cabuyao in the south and around the bay to Cavite. The number of customers has increased in five years from 51,000 to 95,000. The electric railway service of the company during the same period has been increased by the addition of 85 auto-buses operating within the city and suburbs. In the past twelve months, the street cars carried 36,000,000 passengers, while the auto-buses carried 11,000,000.



General View of Botocan Hydro-Electric Power Plant and Penstocks

On the occasion of the completion of the Botocan hydro-electric plant, the company issued a series of official statements and articles on the growth of the enterprise and the new installation which gives a very accurate and interesting résumé of its various activities. Mr. J. C. Rockwell, vice president of the Manila Electric Company describing the main features of the growth of the enterprise says that:

The growth of the Manila Electric Company, while not as rapid as that of the industry as a whole, has, nevertheless, been quite considerable. La Electricista in 1903 had approximately 3,000 customers; the Manila Electric Company has about 95,000. The original Meralco power plant had three 750 k.w. units; to-day, exclusive of small provincial Diesel plants, we now have a total of 46,000 k.w.

We need approximately two million pesos additional capital annually. Of course this amount is not distributed evenly over each year, but about a million is spent annually and then, after a few years, several millions more are spent per year to increase the power plant capacity. Before the Botocan hydro-electric project was finished, our engineers were planning additional power units. At first it was intended to develop the Caliraya River and furnish additional water power, but when the detailed estimates were completed, it was discovered that it would be cheaper to install an addition to our steam plant. In 1931 or 32 a new boiler plant will be installed, as we now have somewhat more capacity in turbines than boiler capacity to operate them; a year later a 15,000 or 16,000 k.w. turbine will be installed.

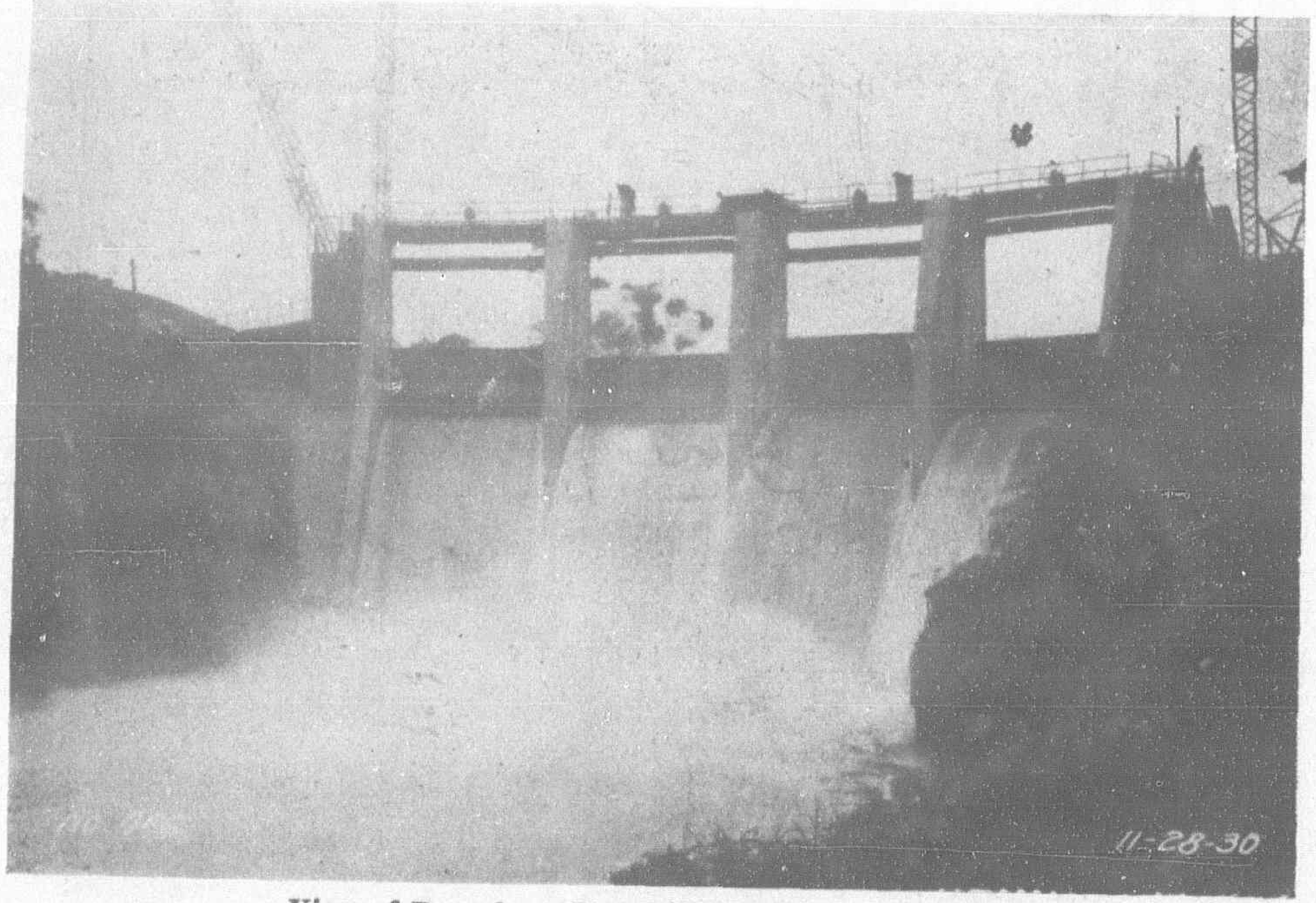
There are a number of water power possibilities on Luzon but they cannot be developed until many years hence because to be economical they must be developed in a large way and we have not sufficient market for the power. When the time comes that large blocks of power can be marketed here, it is not at all unlikely that steam engineering will have advanced to a point where it will still be cheaper to generate by steam than by water power.

The foregoing practically answers the question which we are frequently asked, and that is whether there will be a rate reduction after the Botocan plant is in operation. Botocan was estimated to cost a little loss than five million pesos: it has cost over nine million pesos. A number of factors contributed to the excessive cost but practically all of it was due directly or indirectly to the bad luck we had with the weather during the first half of the construction period.

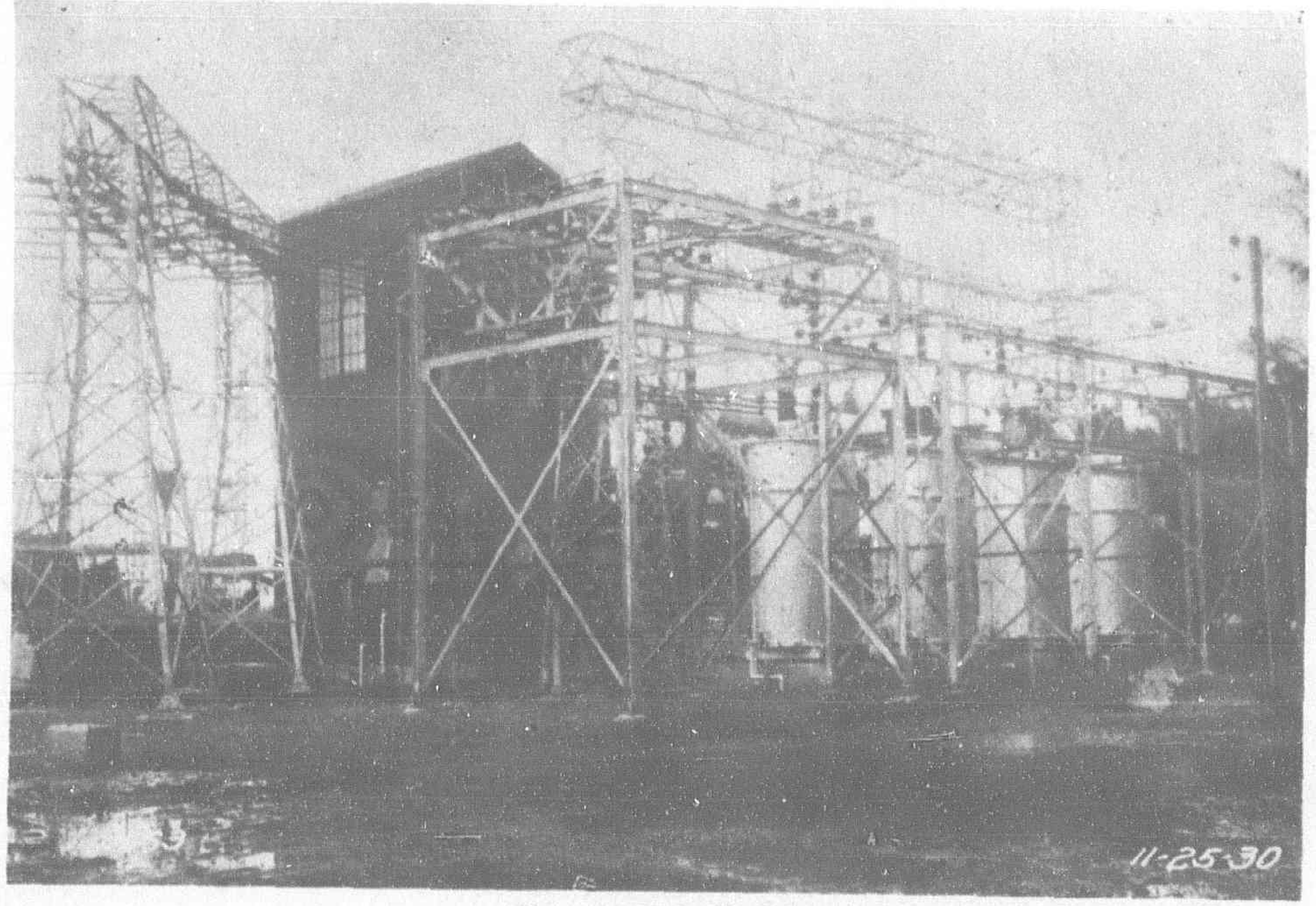
Had the original estimates been as high as nine million pesos, the plant would never have been built, as at that figure the estimated production cost per kilowatt hour would have been higher than in our present steam plant. Indications so far are that we will obtain considerable more power than estimated. If such proves to be the case, we may be fortunate enough to make a saving of approximately one quarter of a centavo per kilowatt hour. On the other hand, undoubtedly the new steam plant which is being designed will be cheaper than the present Botocan plan.

I was in a new Associated System plant in Easton, Pa., last summer where they are producing power for just about one half of what it costs at Botocan. Of course it is a large plant, having 45,000 k.w. units and using an extremely high boiler pressure of 1,450 pounds, and in addition to that it was using distilled water and powdered coal. Unfortunately, powdered coal is impossible for us to use as six months of the year we have so much moisture that the cost of drying the coal would exceed the savings incident to using powdered coal. For a number of reasons high boiler pres-

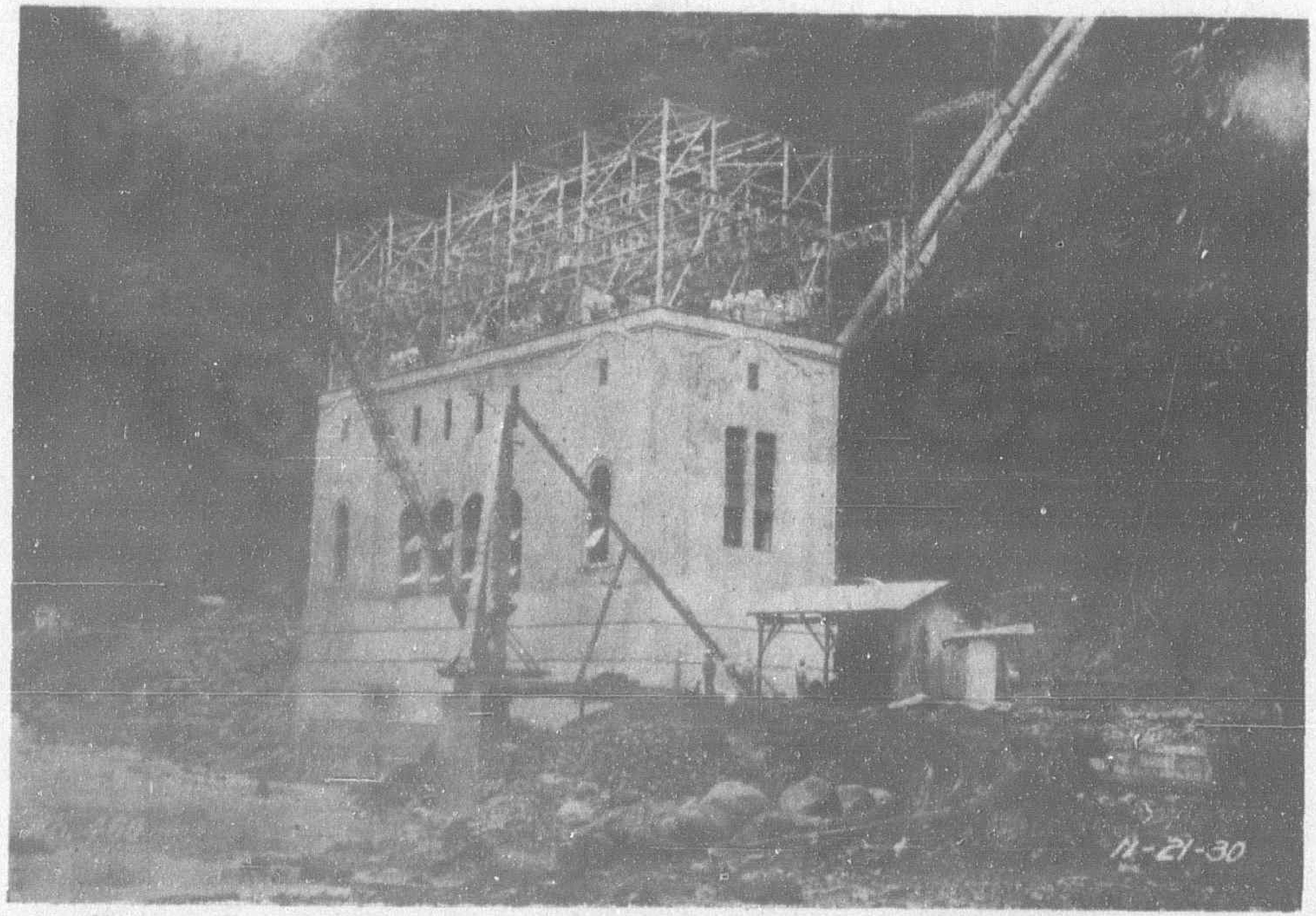
BOTOCAN HYDRO - ELECTRIC PLANT



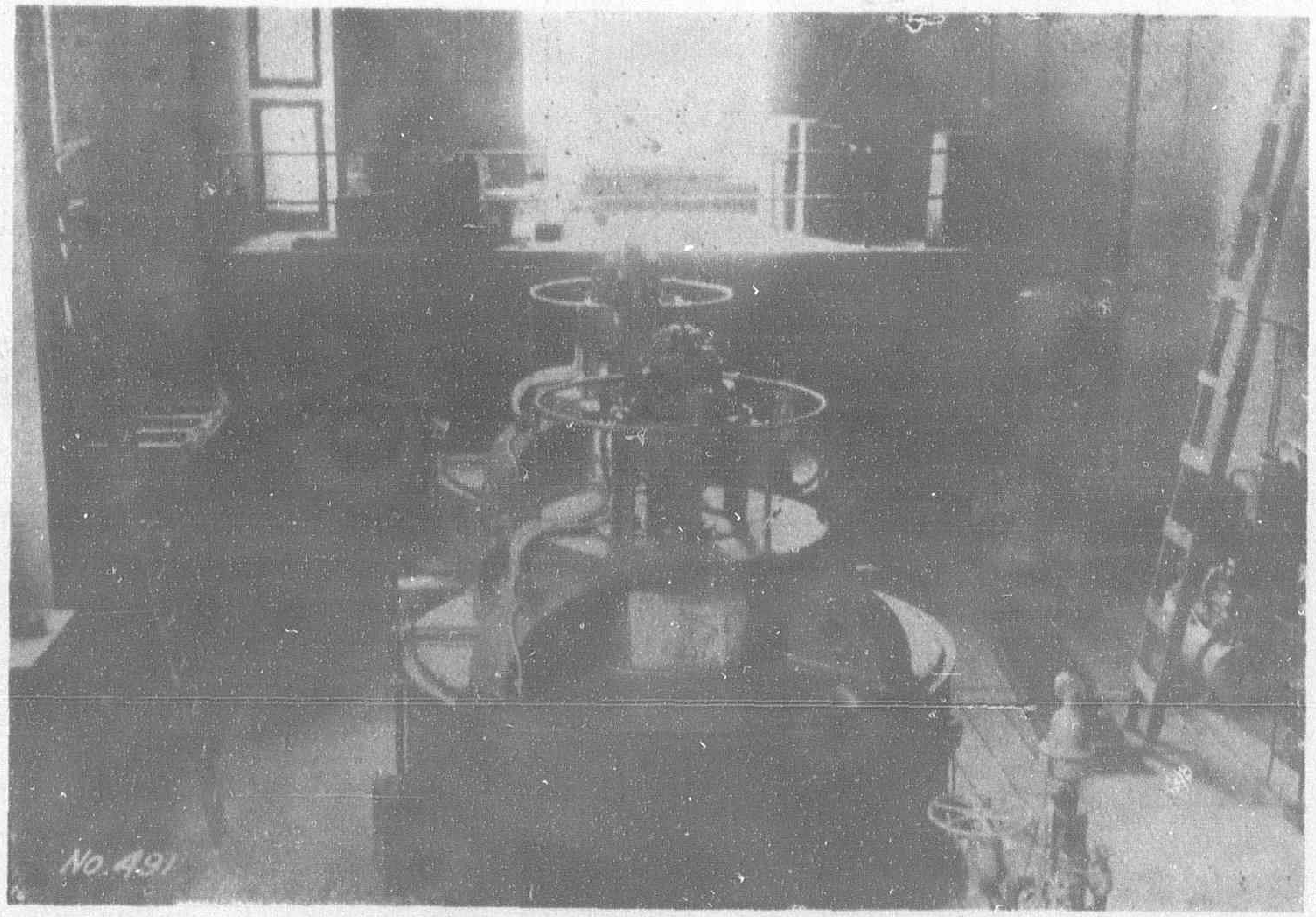
View of Dam from Down Stream; All Gates Open



Botocan Sub-Station



Botocan Power Plant; Penstocks with Electric Cables above at Right Rear



Interior View Botocan Plant 2; 10,000 H. P. Units

View of Pipe Line which connects Tunnel to Penstocks. Surge Tank in background

sure cannot be used. However, the new boiler plant will operate at 450 pounds as compared with our present 200 pounds, and will use distilled water.

We had made a number of rate reductions in the past and will undoubtedly do so in the future, but the last one was so recent that it will probably be some little time before another one is made. It should be borne in mind that the cost of the manufacture of electricity is a comparatively small item in the total cost, distribution being far higher.

Which reminds me of the story of an irate patron of a water company who was complaining that the cost of water in his town was too high, whereupon the President of the Company advised him that he was welcome to go to the reservoir and carry away all the water he wanted for nothing.

Our rates compare very favorably with those in the United States and are considerably lower than they are in many localities more favorably situated than Manila. However, I may say that rates will be reduced as rapidly as possible. That has been the established policy, not only of Meralco, but the whole electric industry for the quite simple reason that a large production sold at a low cost is more satisfactory to everyone concerned than a small production at high cost.

The last annual report of the Manila Electric Company shows a net profit for the last year of Pesos 1,753,284.

This compares with a net profit of P.2,294,978.05 in 1929, or a decrease of P. 541,693.55. However, it is shown that the number of customers has increased, approximately 8,000 new customers having applied during the year.

The operation of railways and busses also registered advances last year, the number of passengers having increased from 47,303,591 in 1929 to 47,463,813 in 1930, or an increase of 160,222.

Total gross earnings of the company in 1930 amounted to P.3,445,820.97. Most of this money went into new construction and development, principal of which was the Botocan hydroelectric plant.

The Associated System, of which the Manila Electric Company is a part, has spent in the Philippines, for extensions and improvements to meet the increasing demands for service, over P.7,000,000 in 1930 alone.

Botocan Hydro-electric Plant

By ROY C. ERICSON

The Botocan River development, one of the largest hydro-electric plants in the far east is now virtually complete. The Botocan River area, located at the foot of Mount Banahao, is subjected to an extremely high rate of rainfall and sudden floods. Although essential to the operation of the plant, the rains made construction difficult and hazardous. Sixteen months of continuous work on a 24 hour day basis was consumed in getting materials to the job and constructing the dam, water conveyances, power house, sub-stations and transmission line to Manila.

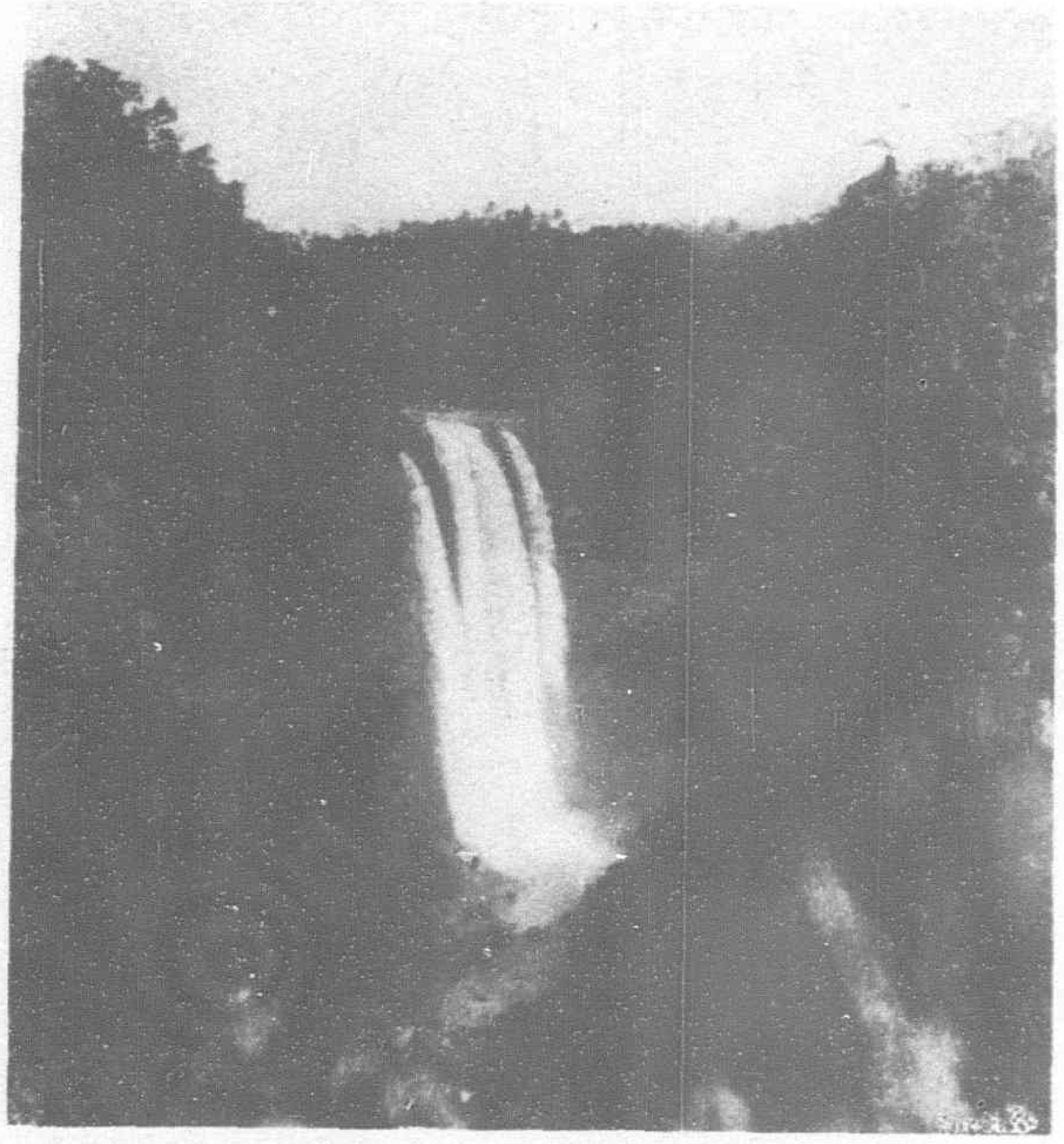
TRANSPORTATION PROBLEM

As in the case of most hydro-plants constructed in remote places, the problem of getting construction materials and equipment to the job, involved considerable effort. When the superintendents and engineers first arrived, it was necessary for them to walk from Luisiana, to Botocan over trails, through rain and mud, a distance of five kilometers. Materials for constructing their living quarters had to be packed in by man power.

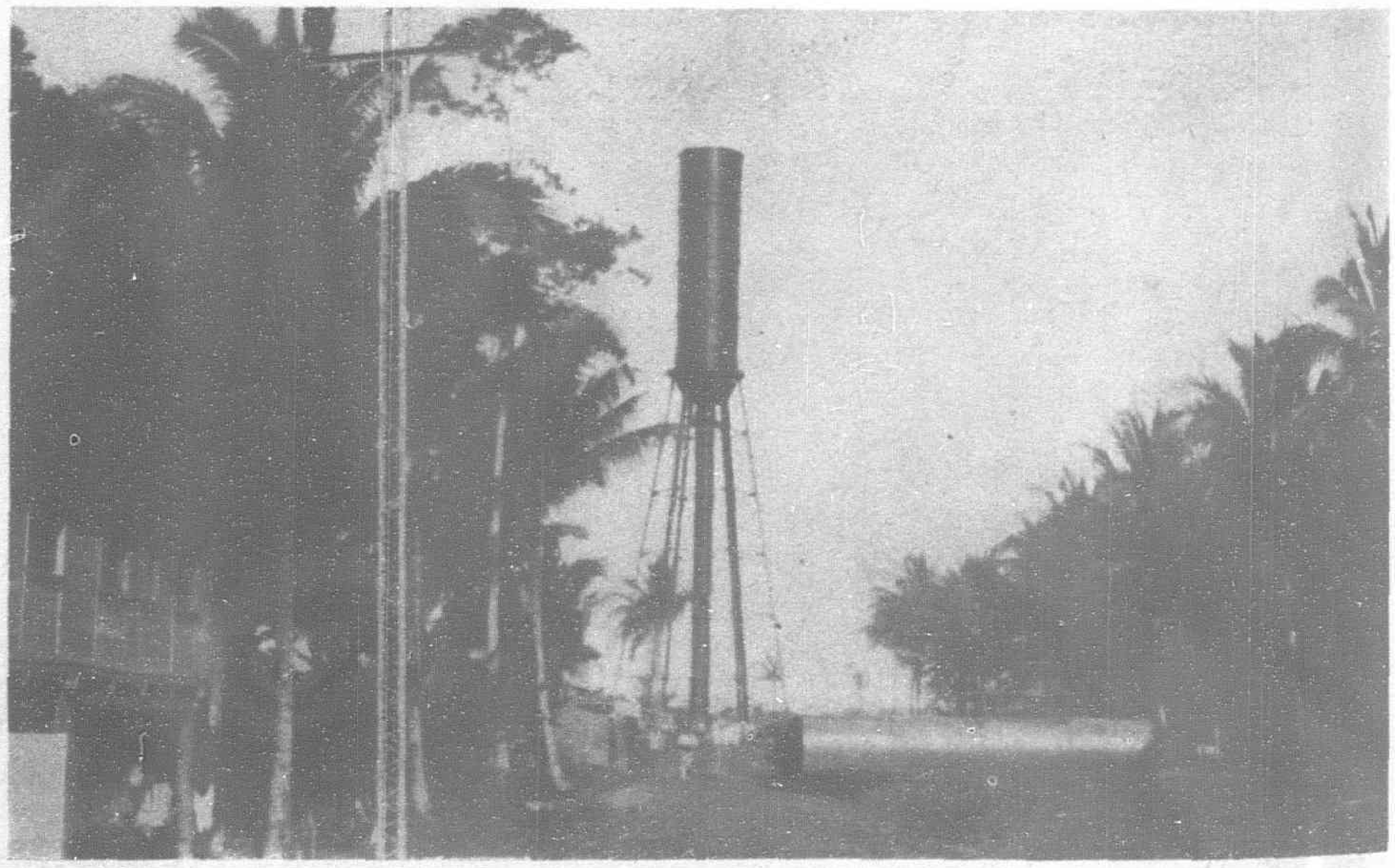
Before any actual work on the project could be considered, substantial roads had to be built over which the heavy machinery could be moved. Roadwork was started in the midst of the rainy season. Quarries were started along the roadway and work continued night and day. After three months of continued effort despite incessant rains, the roadway was complete and ready for a heavy hauling program.

RECEIVING CENTER

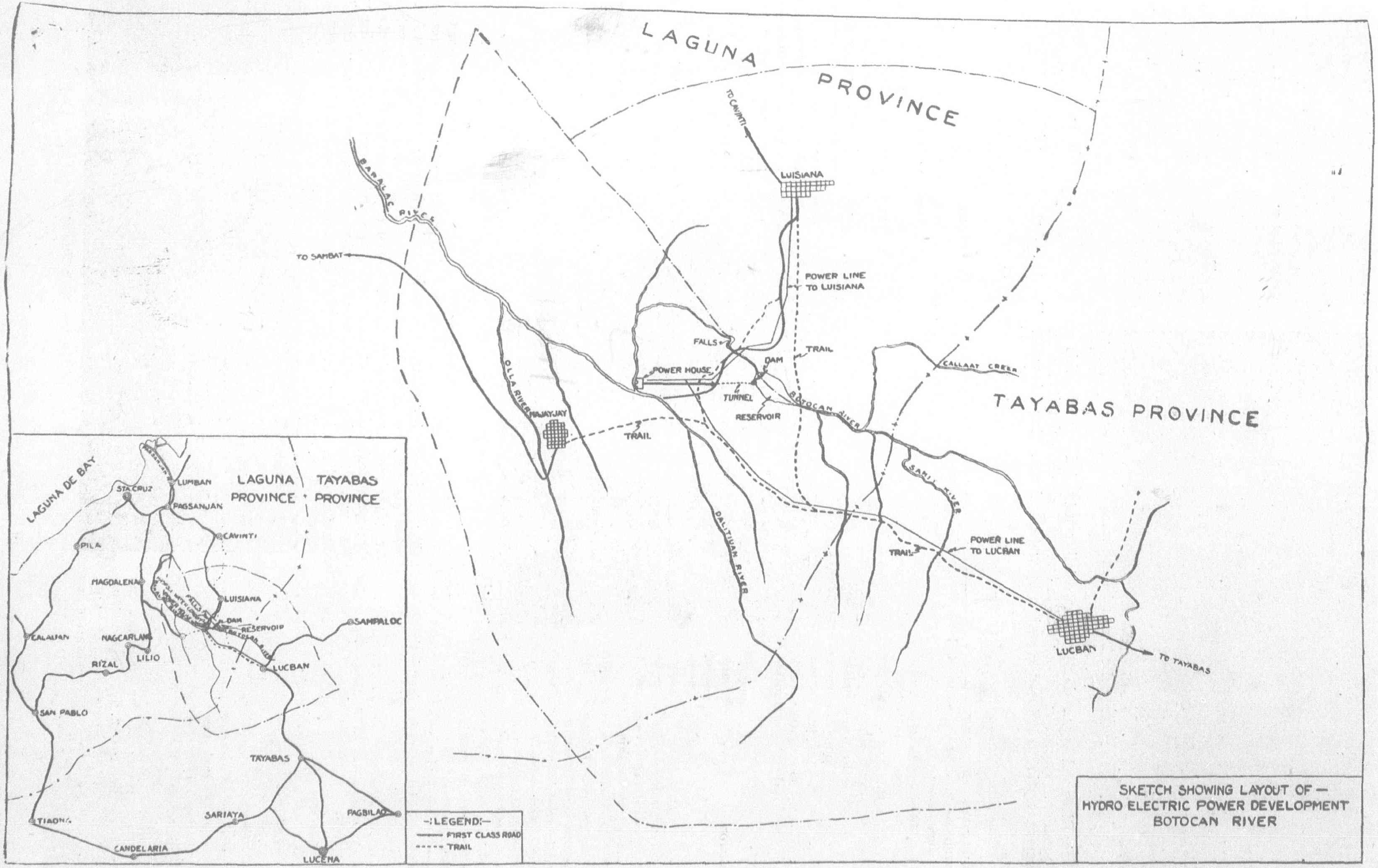
Construction materials in the main came by railroad, and also by a water



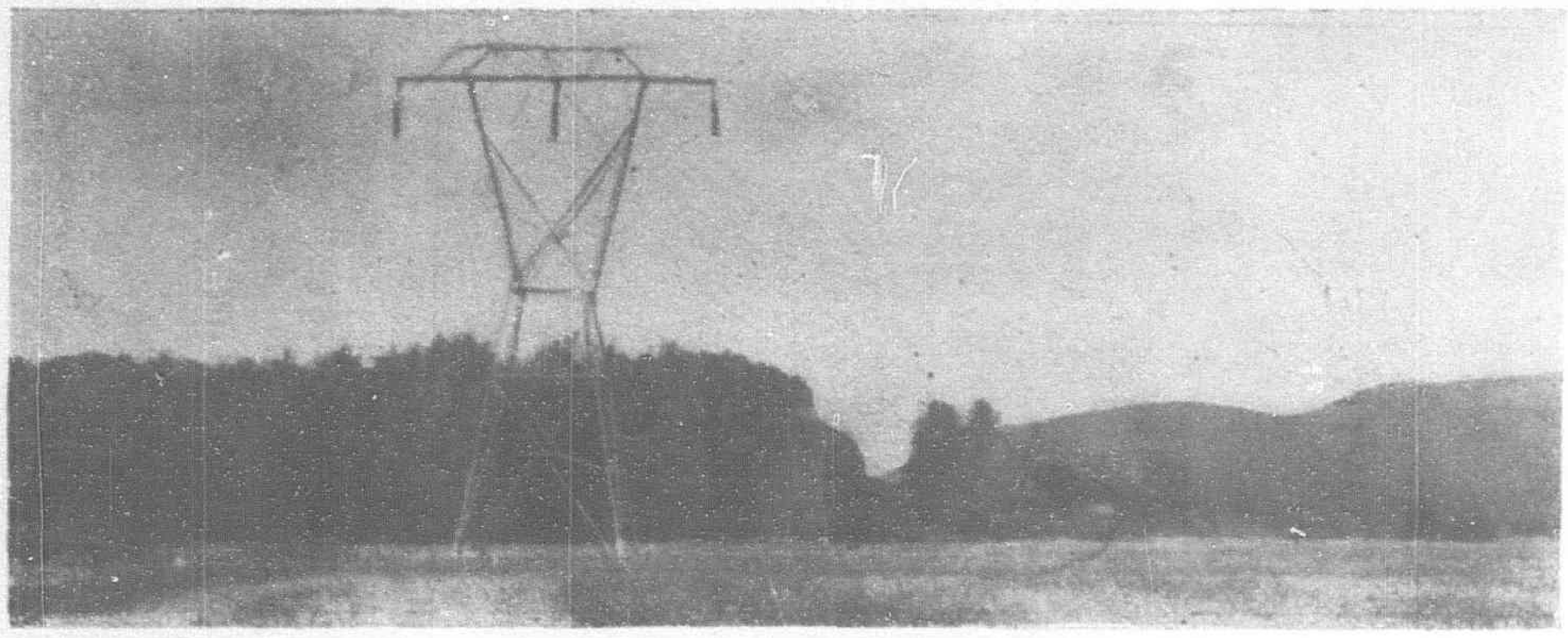
Botocan Falls



Surge Tank



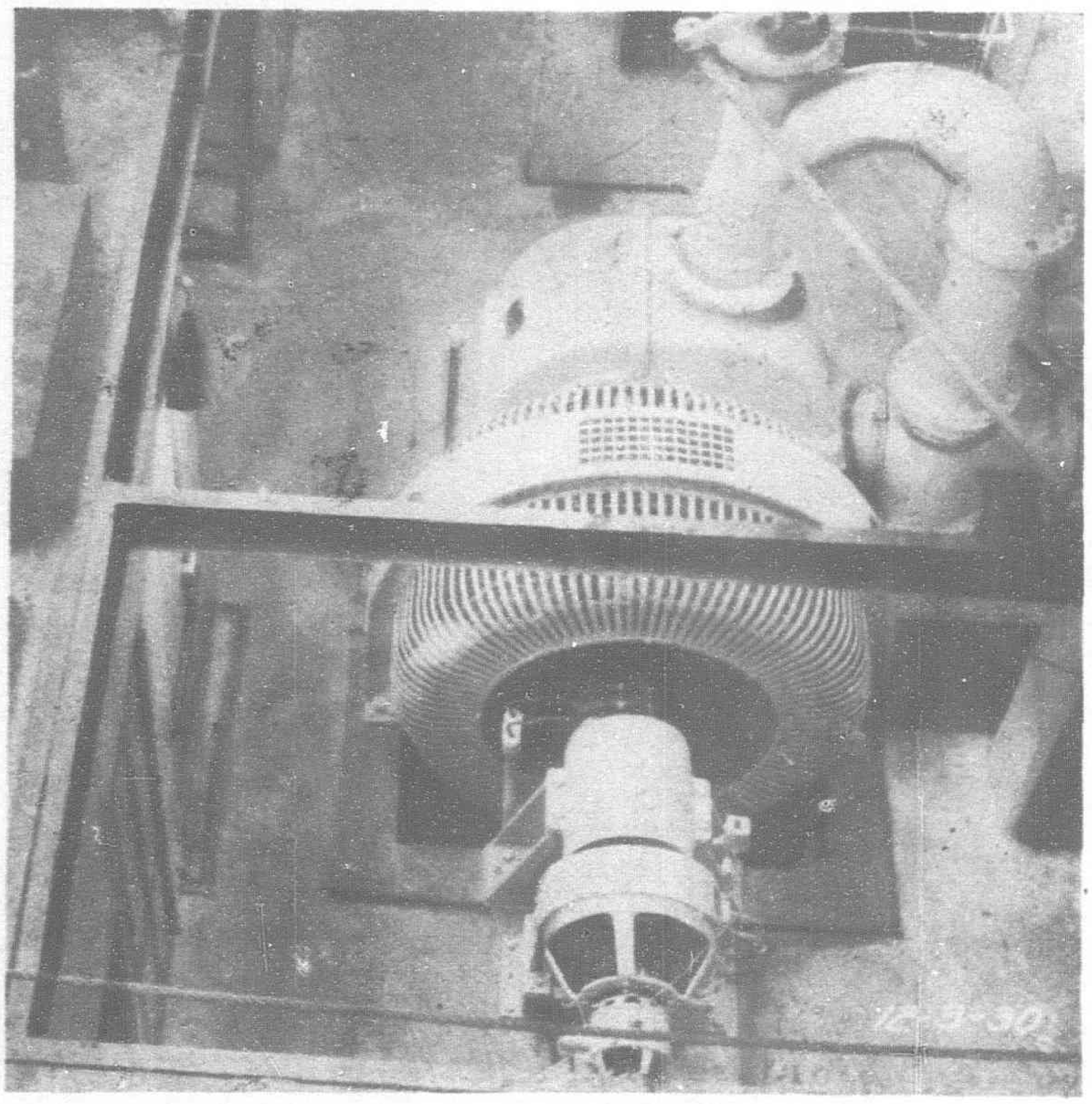
SKETCH SHOWING LAYOUT OF —
HYDRO ELECTRIC POWER DEVELOPMENT
BOTOCAN RIVER



110,000 volts Transmission Line

route *via* Pasig River and Laguna de Bay to a specially constructed wharf at Pagsanjan. Pagsanjan although 24 kilometers from the job, was the nearest point to Botocan accessible by water and rail.

At this point a garage was constructed for servicing the huge fleet of motor cars and trucks necessary for transporting materials to Botocan. Besides the garage, a derrick was erected to expedite unloading of incoming materials and placing on trucks for shipment to the job.



1,200 H.P. Impulse Unit—View from Above

The hauling program involving some eighty motor trucks made traffic regulations essential on the narrow and winding roads. A one way traffic system involving gates two kilometers apart along the line and inter-connected by a series of telephones, worked out well. No serious accidents occurred despite the fact that hauling continued on a 24 hour day basis through all sorts of weather.

THE DAM

Travelling from Luisiana to Botocan, the first structure encountered is the dam. The dam is an overflow type controlled by four tainter gates each 25 feet long and 10 feet high. The dam built in the form of arch with a gravity section is some 180 feet in length along the upstream face and about 77 feet high from its foundation to the spillway. Piers rise above the spillway 31 feet higher making the extreme height of the dam about 108 feet. During construction, temporary rock filled cribs were thrown across the river both upstream and downstream from the present dam. The entire river was then diverted through a wooden flume extending between the cribs. Leakage into the cofferdam was removed by a battery of pumps. Excavation progressed rapidly and it was not long before the first pours of concrete were being placed in the cut-off walls and foundation.

FLOOD-OUTS

Then began a series of discouraging flood-outs caused by an early season. On April 20, the river swelled to flood proportions. Pumps had to be removed, and gates opened to allow the cofferdam to fill with water. During the flooding the flume was partly destroyed. After the water had receded, this necessitated reconstruction of the flume under water. Foundation work had to be carried on during the brief dry spells. Flood outs occurred eleven times during this period. Construction became a continuous cycle of flood-outs, pumping, and foundation pouring until the concrete was finally brought above high water.

CONSTRUCTION OF TUNNEL

The water empounded by the dam enters a tunnel 4,000 feet in length. This was driven from the two ends at one time. The excavation was in the form of a horseshoe, eight feet high and eight feet wide. All sorts of materials were encountered from clay to solid rock. In the clay and boulder sections heavy timbering had to be resorted to.

In this sort of ground excavation was slow and hazardous despite the use of the most modern forms of machinery for conducting this work. The tunnel was lined with heavily reinforced concrete. This was partly placed by a concrete gun, and partly by hand. The finished water passageway is a circle six feet and six inches in diameter.

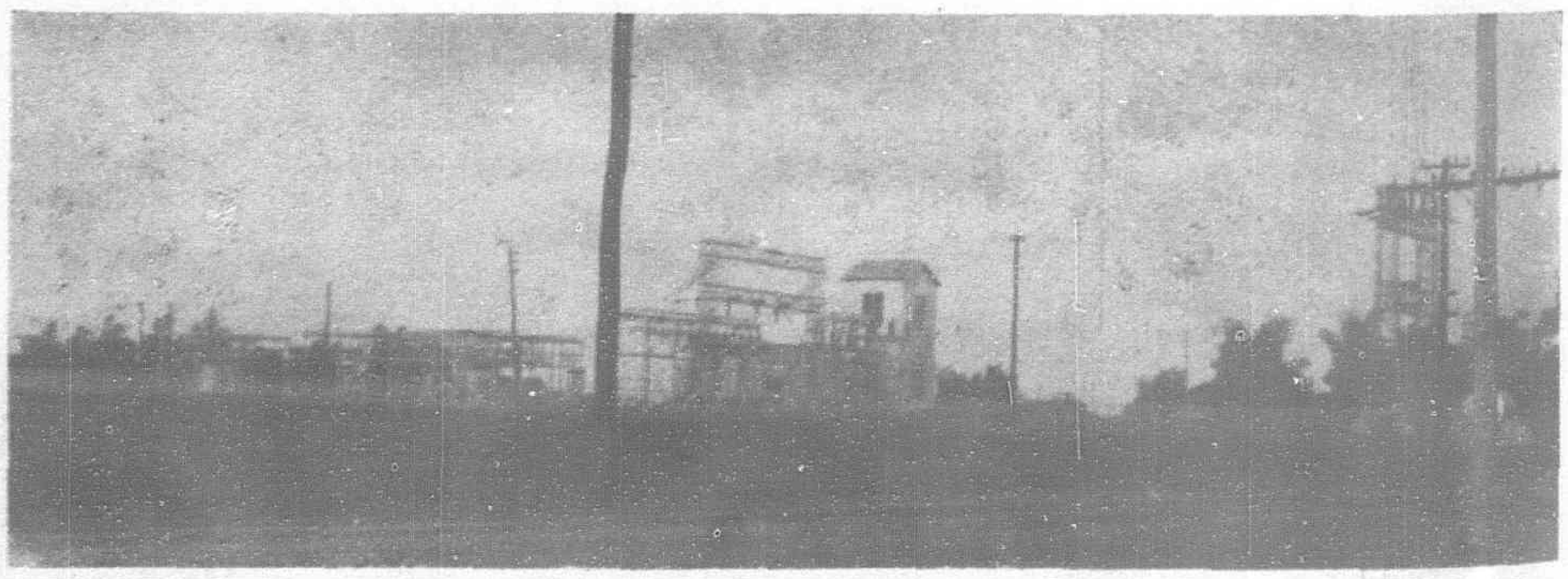
PIPE LINE TO SURGE TANK

Leaving the tunnel, the water is conducted through a steel pipe line of a diameter equal to that of the tunnel. This extends alongside of the provincial road leading to the power house. The sections were assembled on the job by the Pittsburgh-Des Moines Steel Company from rolled sheets sent from their mills in the States. The pipe line extends for a distance of 2,300 feet to a steel surge tank.

At the top of the hill, above the power house, a surge tank is provided that will protect the pipe line against water hammer experienced during the operation of the turbines. Supported on steel columns and a heavily reinforced concrete foundation, the tank stands close to 200 feet in height. The diameter of the tank is about 25 feet.

POWER HOUSE

Leaving the surge tank, the pipe line continues on, to the top of the hill below which the power house is situated. Before construction could begin, this hill over 470 feet in vertical height and sloping anywhere from 45° to 50° with the horizontal had to be cleared of trees and dense undergrowth. Excavation was then begun starting at the top and working downwards. This was followed up by placing concrete slabs, and piers for supporting the



Santa Mesa Substation, Manila

pipes and transmission line towers. During the work numerous slides occurred that hampered progress.

At the top of the hill the pipe line divides into two of a smaller diameter. These were built up into five ton sections at the top of the hill and lowered into place with a temporary cableway. Here they were rivetted together and fastened into place on steel saddles. The pipe are fastened at the top, center, and bottom of the penstock line in huge concrete anchorages.

Current generated in the power house is conducted up the hillside to the sub-station by means of cables supported in towers spanning the penstocks. Protection against damage to the transmission lines and pipe from future landslides are afforded by a network of cables and mesh, together with a series of fences designed to deflect rolling stones away from the penstock line and power house.

Site for Plant

The site of the power house is located at the junction of the Botocan and Dalitiuan Rivers. These two rivers join and flow together as the Banalac River that eventually finds its way to Pagsanjan. Before any excavation could be started, tons of dynamite were consumed in removing huge boulders that had at one time rolled from the mountainside. Spoil tracks had to be run down the river's edge to remove the many thousands of cubic yards of excavation taken from the penstocks and power house foundations.

Two temporary and one permanent cableway were installed for lowering the heavy machinery and the thousand and one parts that go to building a power plant. The permanent cableway still remains as a means of transportation for the operators when entering and leaving the gorge, as well as for handling equipment in the future.

The power house itself is a heavily reinforced concrete structure surmounted by a steel framework for supporting the switching equipment. The installations in the power house are of the latest design. Three independent units are installed for generating current. Two of these are reaction turbines of 10,500 horse power capacity and the other an impulse unit of 1,200 horse power capacity. The larger machines will feed directly to Manila, while the smaller unit will supply current to the surrounding countryside.

Transmission of Current

The current thus generated is transmitted at 110,000 volts to Manila. This is the first transmission line of this voltage in the East. A right of way 30 meters in width follows the shore of Laguna de Bay, a distance of 55 miles and enters Manila from the north. Supported on steel towers, the cables travel over mountains and through rice paddies practically all the way.

At the time constructing began it was expected that the portion of the line traversing the swamp lands could be completed in the dry season. An early rainy season spoiled all plans and made the erection many times more difficult. A span of 12 miles from Taytay to Mabitac was all inundated. Tractors and trucks had to travel through water about two feet in depth. Where the ground was impassable for trucks and carabao, men carried sections of the two and one half ton towers on their shoulders to the points of erection. At these places as many as 350 men, working up to their armpits in water, were used in pulling the wire. Equal difficulty was encountered in the mountainous sections.

Some places were so steep that the tractors had to be dragged up the mountain sides with block and tackle. Temporary cableways had to be strung to transport materials across deep gorges. Difficulties, however, were soon overcome and the line is now carrying Botocan's contribution of power to Manila.

Carrier Current Equipment

Constant communication is carried on between the Manila and Botocan power houses by means of carrier current equipment. This allows the engineers to speak directly over the high voltage transmission line, and maintain complete control of the operations at both plants.

Sub-stations are maintained both at Santa Mesa and Botocan for the purpose of switching and transforming voltages between the power plants and the high line.

Immensity of Project

Although the entire project was constructed with the latest machinery and equipment, as many as 2,500 men were employed at one time. The monthly payrolls brought prosperity to the entire countryside.

The construction work was carried on by the Associated Gas and Electric Company under the superintendence of G. E. Schreiber and E. D. Bean, together with a group of construction superintendents brought with them from the United States. Investigations, engineering and design, were made by Chares B. Hawley and Company represented by J. K. Richardson, F. D. Matthews, and B. S. Philbrick. The entire project was completed in sixteen months of actual construction.

Equipment General Electric

By ATILIO CELIS ; International General Electric Company of New York

The generating, transforming and outdoor switching equipment at the new Botocan Falls power station was furnished by the General Electric Company of Schenectady, New York.

The generating equipment of this important hydro-electric power station consists of 2 S. Morgan Smith vertical reaction water turbines of 10,000 horse power capacity each, direct connected to 10,000 kilovoltamperes General Electric vertical generator. They run at a speed of 720 revolutions per minute and generate alternating current power at 13,800 volts, 3 phase, 60 cycles. Excitation for each one of these large machines is provided by a direct connected exciter and sub-exciters mounted on top of the generator frame. The sub-exciter furnishes excitation to the exciter. By means of this arrangement a very good voltage control can be maintained with the least amount of apparatus.

There is, in addition to these units, another horizontal impulse type water wheel which drives a 1,200 kilovoltampere generator of the same voltage as the above.

Latest Construction

These generators are of the latest design and embody the latest improvements in construction. For instance, its frames are of fabricated rolled and welded steel plate instead of cast iron. This type of frame insures a homogeneous material which is stronger and stiffer than cast iron, the modulus of elasticity being approximately twice that of cast iron. Another advantage of such a construction is that, due to the uniformity of such frame more accurate calculations can be made, resulting in higher efficiencies.

As a result these generators were guaranteed to give at full load an efficiency of 97.4%. This means of course that very little power is wasted resulting in a consequent economical operation.

Factory Tests

Before these machines left the Schenectady factory of the General Electric Company they were subjected to a series of tests to insure successful operation after being installed in the Philippines. One of these tests was that of subjecting the rotating part of the generator to an overspeed approximately 1½ times the normal running speed. Furthermore, these generators were subjected to three momentary short circuits at the armature terminal at intervals of two minutes while operating at no load, rated frequency and 10% over voltage. Under these severe tests there was no displacement of the windings or injury to any part of these machines. In order to test the insulation of the conductors that make up the windings, 28,600 volts were applied for one minute between the wire and the iron ore.

Transportation Problem

The weights of the various parts that make up one of these machines are of interest because of the problem of transportation that they involve. For instance, the stator or stationary part weighed 18 tons ; the shaft and rotating part 24 tons ; the base on which the generator rests 15 tons. The dimensions of the stator piece of this generator were such that it was necessary to ship it in two halves in order to simplify transportation at the shipping point and the receiving point. The crane for the power station had to be of sufficient capacity to lift the heaviest piece after it was assembled, weighing 27½ tons.

Transformers

In order to be able to send this relatively large amount of power economically 50 miles to Manila, high tension must be resorted to and therefore the engineers of the Manila Electric Company calculated that 110,000 volts should be the transmission line voltage. This, of course, meant that transformers had to be installed at Botocan to step up the generator voltage of 13,800 to 110,000 volts. Each one of these transformers is rated 6,667 kilovolt-amperes.

The transformer coils are immersed in special insulating oil. This oil is maintained cool by circulating water in pipe coils located around the inside of the transformer tanks. The latest auxiliary devices are installed on these transformers, such as oil conservators, oil pressure relief valves, gauges, etc. By careful selection of steel and improved design very high efficiencies are obtained; 99.23% was guaranteed in the contract.

The Botocan transformers require 21 gallons of water per minutes at 25°C to maintain them within the allowable temperature guarantees and this water has to be pumped at a pressure of 20 pounds per square inch.

To give the reader an idea of the size of these transformers it is sufficient to state that the height over all is 19 feet, the weight of the core and coils 15 tons, the weight of the tank six tons. The weight of the oil for each transformer is of 16 tons or 89½ barrels. The total weight when assembled 37 tons.

Santa Mesa Sub-station

At the Manila end of the transmission line, that is at the Santa Mesa sub-station, it is necessary to reduce the transmission voltage so that it will be the same as the voltage generated at the Manila electric steam power station. Obviously this required another bank of transformers similar to those at Botocan. These transformers are identical to the ones described above except that no water cooling is used. This oil is maintained at the proper temperature by radiators made up of pipes fastened to the outside of the tanks.

The switchgear equipment both at Botocan and Santa Mesa sub-stations are of remote control outdoor type.

The breakers are operated from panel boards in the control houses by means of solenoids installed on each breaker. The Botocan sub-station breakers operate by 250 volts direct current while those at Santa Mesa use 125 volts direct current. Suitable storage batteries with respective charging motor generator sets are available at both stations.

All of the main oil circuit breakers are rated 15,000 volts with an interrupting capacity of 14,000 amperes. They are all provided with instantaneous trip mechanism, explosion chambers and auxiliary manual mechanism.

Carrier Current

In order to communicate between the Botocan plant and the Manila plant a carrier current system of communications has also been furnished by the General Electric Company and is now installed. By means of this system the same wires used to transmit power at 110,000 volts are also used for telephoning between the two places.

The transportation and installation of this heavy expensive machinery offered many difficulties which made it necessary for the Manila Electric Company to purchase special devices. For instance, in order to lower heavy pieces of machinery 600 feet down the gorge where the power station is located, Manila Electric was obliged to purchase and install a special hoisting equipment. The electrical part of this special equipment was also furnished by the General Electric Company and uses the generative system of breaking. Underslung trailers were imported from America for use in connection with the transformers.

The Port of Hulutao

(Continued from page 191).

be filled in by pumping the spoil dredged from the harbor basin at the back of the retaining dykes. A powerful suction dredge is expected next season.

Laying out of Blockyard: Part of the reclaimed area has been covered already by concrete floors on which 10,000 concrete blocks weighing 60 tons each will be cast and temporarily stored. For the lifting of these blocks and depositing them on cars, a travelling portal crane is ready for operation. From the blockyard, the blocks are to be transported to a jetty, whence they will be set by means of a floating crane and a travelling Titan crane, which is now under construction in Holland and will be despatched from there next spring.

Concrete Making: A small number of concrete blocks has been made by hand pending the arrival of the concrete plant which is now underway. This most modern plant with a capacity of over 5,000 cu. yds. of concrete a day, consists of stone crushers, elevator and sieve installation for sand and stone, large silos for these materials and finally a huge concrete placing tower with a height of 240 feet. Foundations for these structures are almost completed and mounting of machinery and structural parts will be started immediately upon arrival, under the supervision of two experts who will arrive from Europe in a few weeks.

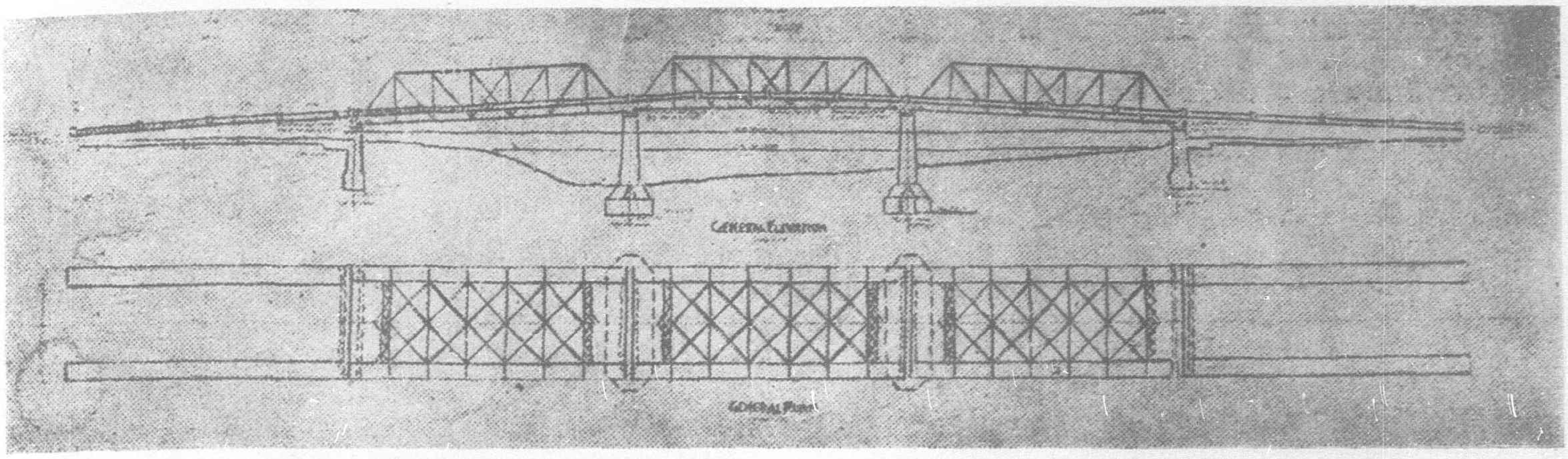
Piers Constructed: Three piers have been constructed, one to link up to the shore with the place where the southwestern breakwater begins, another chiefly to give shelter to floating plant during bad weather and to provide temporary landing accommodation; the third one to form a small inner harbor where the floating plant may be temporarily laid up for repairs. The second pier, known as "Construction Pier" 900 feet in length will later on form a useful part of the harbor, as berthing facilities can be easily provided for alongside.

All preparations necessary are being completed to proceed with the work next season (April-November) according to schedule.

Japanese Steel for Siamese Railways

Each year the government railways of Siam call for tenders for the supply of steel, which are open to all steel makers, and during the past three years, the Japanese Bridge Builders' Association, through its agents, the Mitsui Bussan Kaisha, Bangkok Branch, has submitted estimate. In two successive years the French were successful. News has just been received that this year the Japanese tender is the lowest, and the fact of this success in open competition with the world's steel makers has caused no little elation in Japan, the Minister of State for Railways, Dr. Egi, adding his congratulations and speaking hopefully of Japan's future prospects in the world market. The Japanese bid was successful against some forty competitors of Belgian, Czecho-Slovakian, French, German, American and British nationality. The contract is for the supply of 500 tons of steel for new construction and replacement—plate girders, lattice girders, culverts, etc. Mitsui's bid was not less than Yen 100 per ton delivered in Bangkok. A German bid was second lowest. American bids were highest.

The Government Steel Works in Kyushu will supply the steel, which will pass Japanese government railway specifications, which are severe. While there will be but small profit in this, the first, Japanese contract for the supply of steel to a foreign government it will be of advertising value. Railway engineering in Japan has come much to the fore in the past year. Her engineers are busy in the railway shops of Moscow and other Russian centres, and a Japanese has been engaged by the Persian Government as railway adviser. The Siamese deal will be so handled as to enhance the reputation of the island empire of the east, which is making a name for itself in a department of activity hitherto confined to a few western nations, whose one-time monopoly in so many branches of engineering is now at an end.—*The Engineer.*



Design of the proposed steel bridge across the Pasig river at Mandiola Street on the east side of the Malalcanang Palace, prepared by Designing Engineer D. Guanio. The bridge will consist of three-steel-truss spans 420 feet long, estimated to cost P700,000. This will accommodate four lines of traffic with sidewalk at each side

New Pasig River Bridges for Manila

THE Philippines Bureau of Public Works has announced the early construction of a P.700,000 three-span steel bridge at Calle Mendiola in an effort to help solve the traffic in Manila. The plans and specifications for this proposed additional bridge across the Pasig river have been approved.

The project will be financed from the proceeds of the P.2,000,000 bond issue which is a part of the P.10,000,000 bonds authorized by the legislature for the city of Manila.

The bridge would measure from end to end of the steel structure about 420 feet, each span measuring 140 feet. Domingo Guanio, designing engineer of the Public Works Bureau, who drew the plans, estimates that the new bridge can accommodate about one-third of the present traffic across the Pasig river, thereby relieving part of the traffic congestion on the Jones bridge, the Santa Cruz bridge, and the Ayala bridge.

The need of another bridge across the Pasig river has been felt for many years, and only the lack of funds has delayed its early construction.

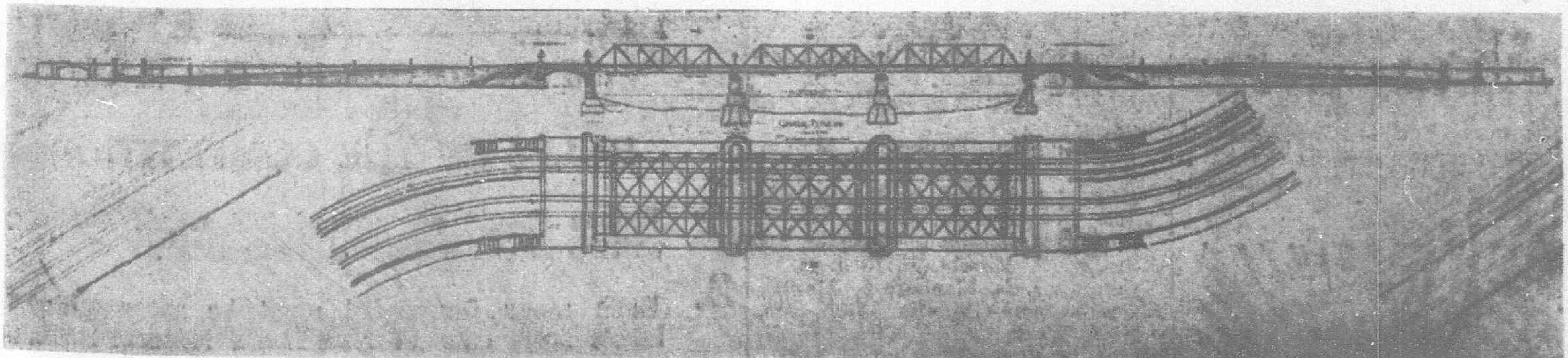
Realizing the urgent need of connecting the railroad lines alongside of the deepwater piers of Manila to facilitate the transfer of merchandise brought in by ocean steamers, the Bureau of Public Works has worked on a plan to build a P.3,200,000 combination railroad-electric railway-highway bridge, the largest bridge in the Philippines, fully equipped with railroad tracks across the Pasig river, starting from Del Pan Street to Bonifacio Drive.

The project is a substitute for the plan of building a tunnel across the Pasig river to extend the railroad tracks to the port of Manila. The Public Works engineers, after a long study of the proposed tunnel, concluded that such a project is impractical in view of the fact that the tunnel will require too long grade approaches. The operation of the tunnel will be very costly, and the government will hardly maintain its operation. Added to these difficulties is the kind of soil of the port area. The engineers of the Public Works declared that the soil in that vicinity is loose, and because of that the grade approaches in the side of the port area would end almost in front of Pier Seven.

The proposed bridge would measure from end to end of the steel structure about 435 feet, each span measuring 145 feet. It will provide two 30-foot and one 27-foot roadways where the traffic, including street-car line and all kinds of vehicles, will pass, and two 12-foot sidewalks with fill approaches. Domingo Guanio, designing engineer of the Public Works, estimates the cost of the bridge to be around P.3,200,000.

The proposed bridge will not only bring the railroad alongside the piers, but will also help solve the traffic problem across the Pasig river. The new bridge will accommodate one-way traffic for two roadways, with a capacity for three lines of traffic on each side. The traffic for the Manila south road can be taken care of by the proposed bridge, thereby relieving the Santa Cruz and the Jones bridges of much weight.

This project is the first of its kind in the Philippines. The location of the proposed bridge is considered the most suitable to remedy the traffic problem across the Pasig river and to extend the railroad tracks.—*Manila Bulletin.*



Design of the proposed combination Railroad-Electric Railway-and-Highway Bridge across the Pasig river connecting Bonifacio Drive and Del Pan Street, prepared by Designing Domingo Guanio of the Public Works. The bridge will consist of three-steel-truss spans 435 feet long and 111 feet wide, estimated to cost P3,200,000. This will accommodate six lines of traffic, two lines of railroad track, and sidewalks at each side

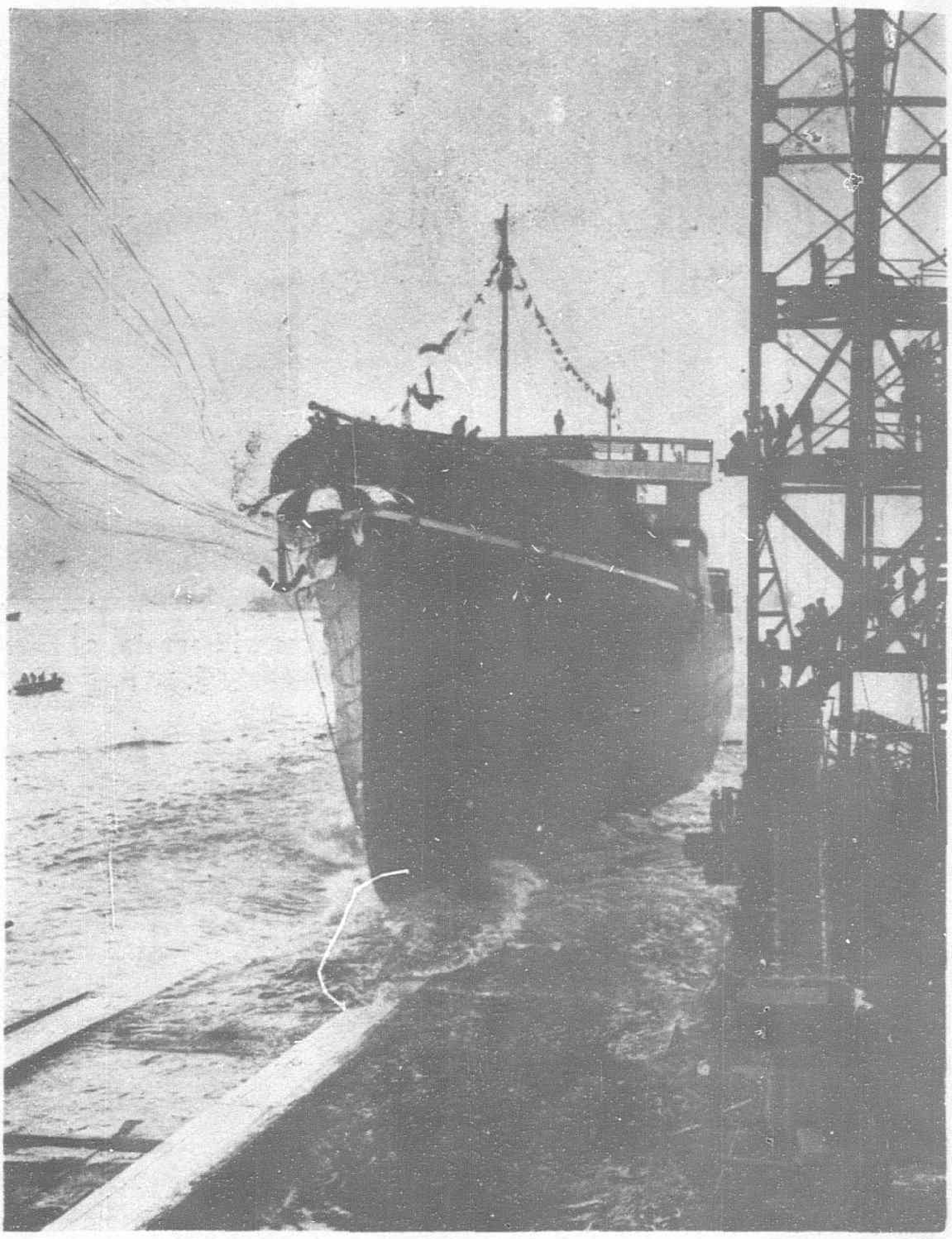
Motor Tanker "Teiyo Maru"

The launching of the Motor Tanker *Teiyo Maru*, was successfully performed on January 19 at the yards of the Yokohama Dock Company, Ltd., in the presence of Admiral Taniguchi, Chief of the General Staff of the Imperial Japanese Navy. The vessel is being built to the order of the Nippon Tanker Company, Ltd., for use in conveying bulk oil to Japan.

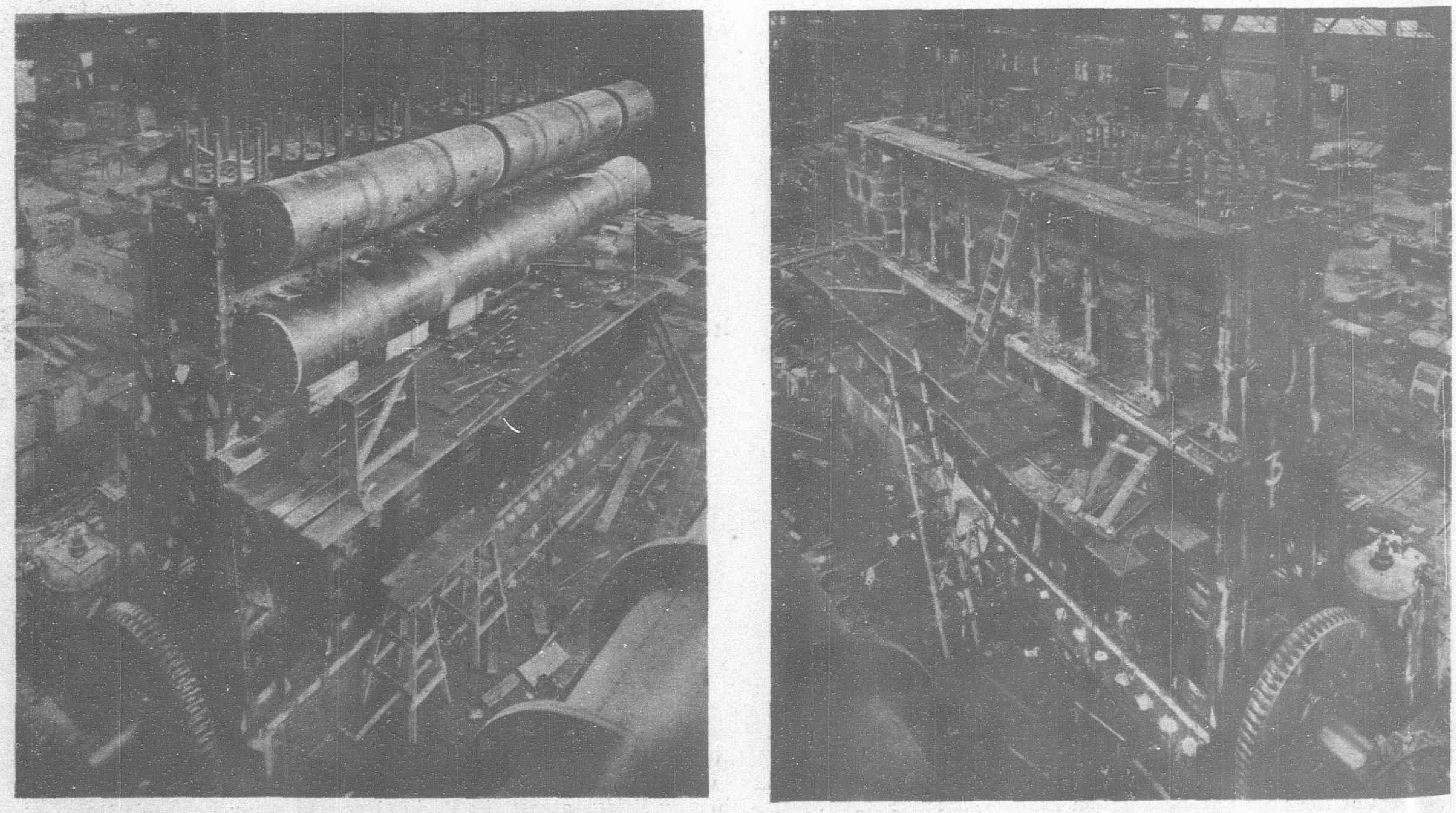
The *Teiyo Maru*, when she is commissioned, will not only be the largest tanker in Japan, but one of the highest speed motor tankers in the world. The main features of the *Teiyo Maru*, are as follows :—

Length, P.P.	490′-0″
Breadth mould	64′-0″
Depth mould	38′-3″
G. T.	9,000 tons.
D. W. T.	12,500 ,,
Loaded draft	28′-3″
Speed on trial...	16 kts.
Service speed	15 ,,
Normal engine power	7,200 bhp.
Revolutions	125 r.p.m.

The main propelling machinery will consist of two sets of Yokohama M.A.N. double-acting, two stroke, airless injection Diesel engines, each of six cylinders of 600 mm. bore and 900 mm. stroke and to have power of 3,600 bhp. at 125 r.p.m. As this ship has powerful pumping capacity about 1,200 tons per hour, there are four sets of steam driven oil pumps, and two large cylindrical boilers of marine type and one exhaust gas boiler. All auxiliary machinery are driven by steam.



Launching the "Teiyo Maru" at the Yokohama Dockyard, the largest Tanker Built in Japan

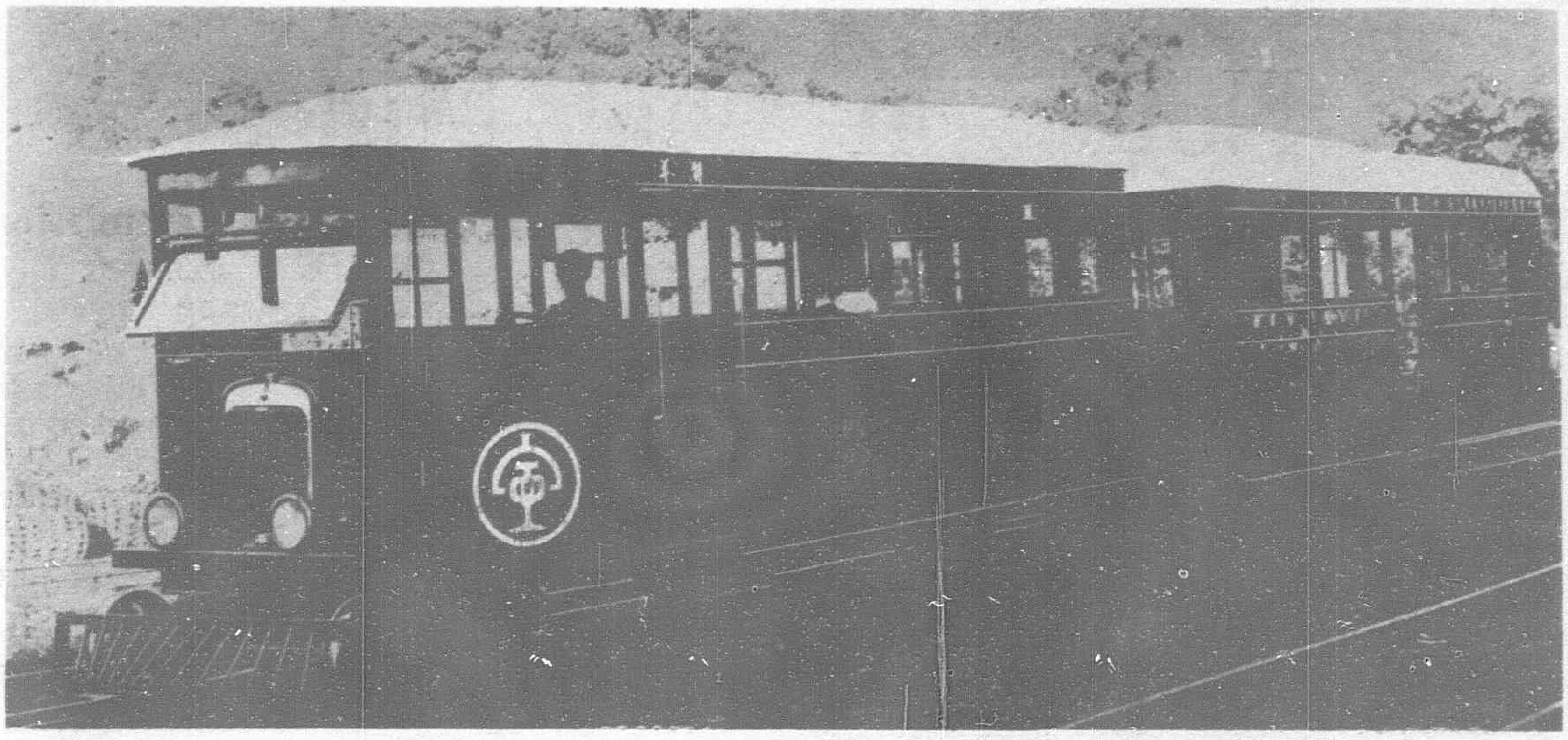


Main Engines of the "Teiyo Maru" under Construction by the Yokohama Dock Company, Ltd. Two Sets of Yokohama M.A.N. Double acting, two stroke, Airless injection Diesel engines, each of six cylinders of 600 m.m. and 900 m.m. stroke, to have 3,600 B.H.P. at 125 r.p.m.

MOTOR RAILWAYS IN SOUTH CHINA

Interesting Details of New Fleet Erected by China Motors on the Sunning Railway; Cheap, Modern Transport Methods

Rail Cars Run on Dodge Chassis



DEPARTURE IN RAILWAY TRANSPORT IN CHINA

On Feeder Lines to the Sunning Railway in South China, Engineers have Constructed Bodies on Dodge Chassis. These have been in Operation Since August and are Working very Satisfactorily

After extensive study, Koppel engineers have developed the equipment necessary to convert Dodge Brothers chassis into railway motor cars of super strength and power for either standard or narrow gauge. The results in service prove that this equipment fulfills its purpose to the highest degree of satisfaction. Patents covering special forms of construction have been applied for.

In the accompanying illustrations the rail motor is seen as operated on the Sunning Railway, the conveyances being supplied by China Motors of Shanghai, and they are the first of their kind in this country.

The total length of the Sunning Railway is 96 miles. The railcar with a trailer is being operated between the city of Toishan and the city of Pakshah, a distance of 32 miles. This railcar makes four return trips each day. The average number of passengers carried on railcar and trailer is 1,000 per day. The gasoline consumption is about 7.4 miles per one American gallon. As the Sunning Railway are using a "Y" shaped track instead of a turntable to turn the cars around, and as they do not have a reversing transmission, a good deal of gasoline is being wasted in switching. The consumption given includes this waste of gasoline. The correct consumption is 8-9 miles per gallon.

The other Dodge Brothers railcar which runs without the trailer is being operated between the cities of Toishan and Kungyick, a distance of 20 miles. This railcar does not run on a regular schedule, but it leaves from either terminal as soon as there are a sufficient number of passengers to make a trip. This railcar carries an average of 400 passengers per day. The gasoline consumption is about the same as the other railcar.

Advantages

Running a passenger car or truck on rails is much simpler than on the highway. There is no steering to do, no tyres to change, no traffic to consider. Corners, with their wear and tear on tyres and thrust members, do not exist, and there are no hills, at least as the chauffeur knows them.

The railway motor car is the lightest form of rolling stock now in use. Its weight per passenger is but a fraction of that for a steam train or an electric car. Because of this light weight, the upkeep of track is reduced to a very small item. On the other hand, it is possible to run these cars safely over a road-bed that would have to be abandoned if any other type of rolling stock were used. Their utility in a country like China, which calls loudly for transport facilities, can, therefore, be appreciated.

On railroads where passenger and freight traffic is small and bound to remain so for years to come, no matter what facilities for travel are offered, motor cars or trucks mounted on the specially designed flanged wheels and pony trucks can relieve steam trains of unprofitable trips.

To Any Dodge

The flanged wheel units are composed of a four-wheel swivel type truck for the front part of the chassis and two flanged drive wheels to replace the pneumatic rear wheels.

By the use of specially designed flanged drive wheels, they can be arranged for a maximum of 60 and a minimum of 50 inch track gauges. These units are designed in such a way they can be applied to the chassis by any Dodge dealer.

For track gauges less than 50 inches, it becomes necessary to rework the rear spring arrangement and replace the rear axle housing and drive shafts by correspondingly shorter ones, according to specified track gauge. Such work has to be performed by the builder of the rail car conversion units, and consequently the chassis has to be shipped to our factory for rebuilding and mounting of the flanged wheel equipment to chassis.

Cars Detailed

Following are brief specifications for the 42-in. track gauge car:

Front end equipment:—Pony Truck; Four wheel swivel type (wheels inside of truck frame), Wheelbase: 38 inches. Wheels: 18 inches dia., special ferro chrome iron with standard chilled tread and flange. Tread and flange to be ground smooth and true. Axles: Alloy steel. Bearings: Timken roller type fitted into bearing boxes. Bearing Boxes: Dust proof, self-aligning and provided with alemite oiling device. Pedestals: Malleable iron or cast steel. Center Plates: Malleable iron or steel. Side Bearings: Roller, anti-friction type. Truck Frame and Bolsters: All steel construction. Shock Absorbency Cushions: Rubber, enclosed in steel holders, to absorb the initial shock submitted from the wheels. Pilot: All steel construction, attached to frame of pony truck. Brake: Operated through the steering wheel and applied to all four wheels on pony truck. Brake Shoes: Removable type, cast iron. Brake Shoe Heads: Malleable iron. Pony Truck Application: The front springs of Dodge chassis are attached to truck body bolster with original clips furnished on chassis. Weight of pony Truck: 1,400 to 1,600 lbs.

New Railway Shop in Taiwan

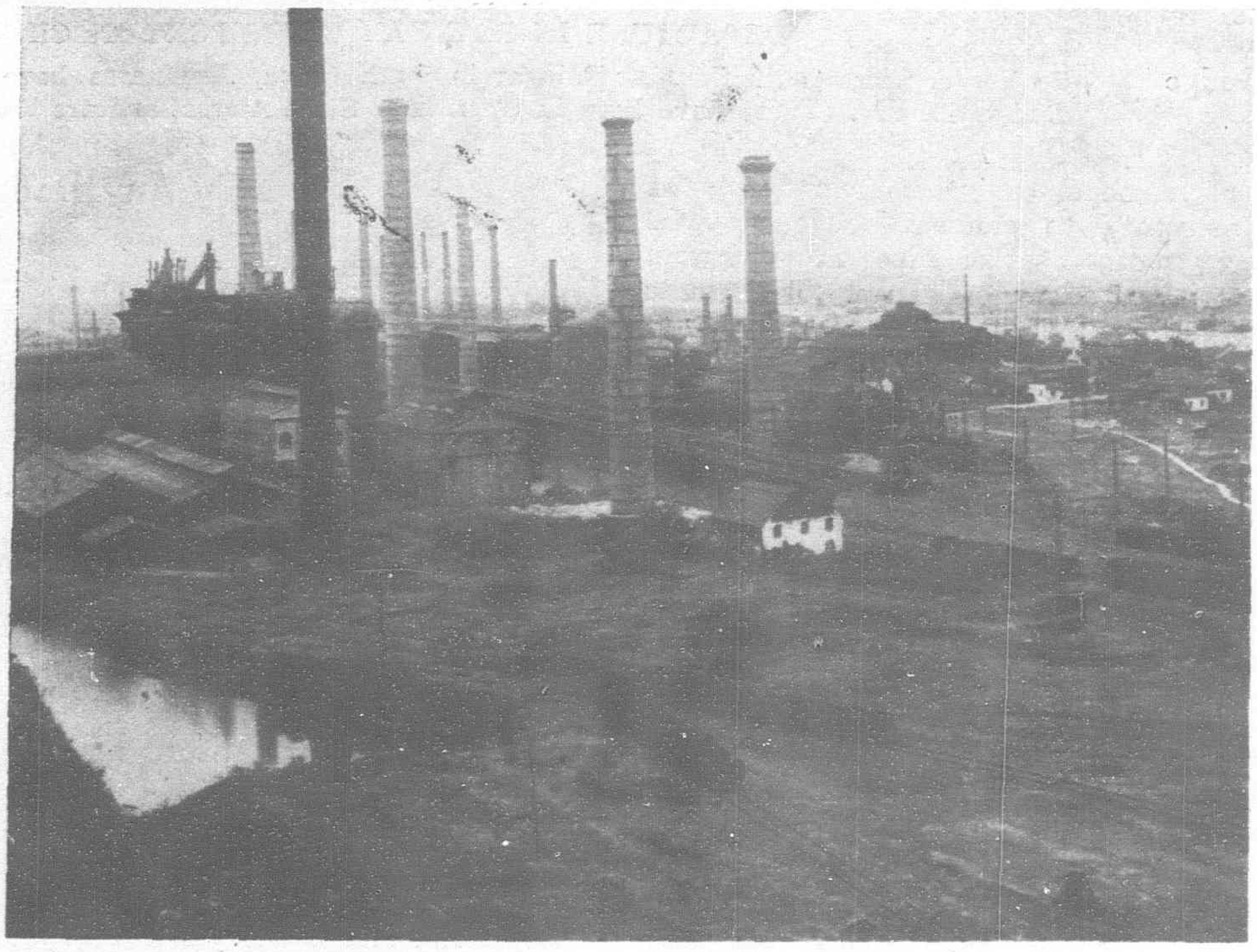
Leveling of the ground has been started on the site for the new railway shops at Matsuyama, a suburb of Taihoku, Taiwan. This site of 1,850,328 square feet will be occupied by modern railway workshops and offices with a floor area of 341,595 square feet, which may, if the need should arise, be extended to 498,168 square feet. Plans call for the laying of approximately six miles of tracks in and leading to these shops. The buildings are scheduled to be completed within three years at a cost, including site and buildings, of approximately 3,120,000 yen (the yen is worth about $0.495).

Notes on Coal Mines in China

From 1930 Report of Reconstruction Commission

Chang Hsin Coal Mine, Chekiang

The Chang Hsin Coal Mine is located at the district of Chang Hsin, 20 miles from Taihu, 90 miles from Hangchow, in the richest farming and industrial area of Chekiang province. The coal is of high ash secondary composition, approximately as follows, ash 25%, moisture 1.5%, volatile matter 38%, carbon 35.5%, sulphur 3%, B.T.U. 10,000. The thickness of the seam is two meters inclined at 60 degrees. Another seam above of better quality with 16.5% ash is being developed. A third seam of 10.7% ash remains to be proved whether it is workable. This mining area is 25 square kilometers, estimated to have over 30,000,000 tons reserve. Due to its access to the markets, this coal has a ready sale of 300 tons a day at $8.50 per ton at the canal port, located 15 miles from the mine. The present daily output is 400 tons, but it is expected to be increased to 800-1,000 tons by the end of this year.



The Han Yeh Ping Steel Works: As a result of continuous warfare these works have been closed down for some years. It will cost several million dollars to restore them to working condition

The original Chang Hsin Mining Company was established in 1913 by merchants of Chekiang and Shanghai. Five shifts were sunk, two at Ta Ma Shan and three at Sze Mow Teng, and three hundred thousand tons of coal were produced during a period of eleven years. However, it proved to be a business failure and the mines were closed down in 1924. During the subsequent years, the mine went from bad to worse; shafts were flooded, machinery rusted and small parts were lost, the mine railway was torn up at several places, and one of the large bridges broke down. Under these conditions, the National Construction Commission took over the management in August, 1928. As a result of the efforts of a group of technical experts, the railway was repaired and completed in May and shafts reopened one by one since July, 1929.

At present there are two groups of shafts. The eastern group is at Sze-Mu-Teng and the western at Tai-Mai-Shan, each with two vertical shafts of 100 meters to 200 meters along the strike of the lower seam which supplies all the output at present. The eastern group produces about 300 tons; the western group produces only 100 tons a day as it is still in the development stage. The mine is equipped with steam power plant, water supply lines, machine shops, pumps and air drills. An electrical power plant of 750 k.w. capacity is being erected. A 36" gauge railroad 24 meters long has been built from the mine to the canal. This railroad is equipped with three Baldwin engines and about 30 steel bottom-dumped cars. A third group of mines to the north of the present workings is being developed.

Extensions costing approximately $400,000 are being planned. These include a 750 k.w. power plant together with pumps, hoist, transmission lines and transformers, two shafts to work the upper and better seam, two miles of railroad connection, steam launches with tug boats, and other equipment. It is estimated that the annual profit will amount to $300,000 taking interest and depreciation into consideration. It is expected that the mine will be able to take care of itself financially.

The Hwai Nan Coal Field, Anhwei

The other coal field under the management of the National Construction Commission lies in the Hwai Yuan, Showhsien and Fongtai districts of Anhwei Province. It extends along the south bank of the Hwai River about 30 miles from Pengpu, a station on the Tientsin-Pukow Railway, and 130 miles from Wuhu on the Yangtze River. The region around this field lying between the Hwai and Yangtze rivers is a level plain containing rich farming lands.

According to data obtained from the Tatung mine, a colliery located near the claims of the National Construction Commission and which has been worked for years, there are altogether 18 coal seams, 15 being workable. The total thickness of workable seams is about 112 feet.

The following table shows the thickness of the different seams and their intervening strata:

Strata	*Thickness of Coal*	*Thickness of Rock*
Coal (1st)	11′	
Rock		2′
Coal (2nd)	8′	
Rock		3′
Coal (3rd)	9′	
Rock		80′
Coal (4th)	5′	
Rock		22′
Coal (5th)	24′	
Rock		60′
Coal (6th)	7′	
Rock		22′
Coal (7th)	6′	
Rock		30′
Coal (8th)	12′	
Rock		60′
Coal (9th)	5′	
Rock		28′
Coal (10th)	5′	
Rock		45′
Coal (11th)	4′	
Rock		150′
Coal (12th)	16′	
Total	112′	512′

The coal reserve in Concession No. 1 is estimated to be approximately 150,000,000 tons. The total reserve will reach over 50,000,000 tons. Mr. C. C. Wang of the Geological Survey of China, states that of the bottom of the basin which is surrounded by the claims of the National Construction Commission is not so deep seated as to be unworkable, the reserve along the outcrop makes this field one of the best in lower Yangtze Valley.

Chemical Analysis of the coal (by C. C. Wang of Geological Survey).

Seam	*H_2O*	*Vol. Mat.*	*Carbon*	*Ash*	*Ash Color*	*Coking*	*Sulphur*	*Calories*
No. 1	.30	42.95	48.83	7.92	Gray	Coking	.571	7,415
No. 2	1.15	32.37	60.15	6.33	Reddish	,,	1.20	7,977
No. 3	.85	34.90	54.75	9.50	White	,,	1.28	7,777
No. 4	1.00	33.93	56.97	8.10	,,	,,	.985	7,865
No. 5	.70	36.30	45.30	17.70	Gray	,,	.67	6,958
No. 6	1.33	30.20	54.00	14.47	,,	,,	2.00	7,270

In Concession No. 1 two circular shafts of four meters diameter with cut stone lining, 100 meters deep, are to be completed this year. These shafts will handle a daily output of 1,500 tons. Another set of two smaller shafts are to be sunk in the near future Output will be curtailed below normal tonnage before the transportation facilities to the Yangtze are completed. Meter gauge railroad connection of eight kilometers between the mine and Hwa River is to be laid at once. Small steam launches and boats will connect the mine to Pengpu. This program will be completed in a year's time with a total cost of only $300,000.

Due to traffic congestion on the Tientsin-Pukow line, it is proposed to build a special meter gauge railroad extending from the Hwai River to the Yangtze Bank opposite Wuhu, a distance of 190 kilometers. Surveys are being made and construction is expected to begin when the mines are fairly developed. Railroad experts assert that this narrow gauge railroad will not only become a self supporting line but will give a net profit of a million and half a year beside affording transportation of the coal. The estimated cost f.o.b. Yangtze will be $4.00 to $5.00 per ton. This will put the mine in a favorable condition to compete in the lower Yangtze markets. It will give also an abundant supply of coal for the development of electrical power plants as planned by the National Construction Commission and the industrial development of the entire region. The cost of the whole project will be exceptionally large, the railroad and loading stations alone costing from five to six million dollars. The National Construction Commission will try to finance the first part of the work, by the flotation of either a foreign or domestic loan in order to expedite the work.

The Han Yeh Ping Coal and Iron Works

Although this plant has been closed down during the last few years it is the largest and best equipped iron and steel works in the country. The National Construction Commission has made an investigation of its coal and iron mines as well as the iron and steel plant. A scheme to put these works into good working condition, costing about four million dollars is under consideration.

The works have been losing money ever since they started. The following table shows their financial condition :

1909 ..	$15,400.53 profit	1917 ..	2,801,872.20 ,,
1910 ..	64,151.71 ,,	1918 ..	3,779,904.47 ,,
1911 ..	$2,301,500.85 loss	1919 ..	2,918,463.63 ,,
1912 ..	2,872,075.52 ,,	1920 ..	1,279,588.44 loss
1913 ..	1,538,389.82 ,,	1921 ..	511,835.03 ,,
1914 ..	100,967.97 ,,	1922 ..	3,666,876.36 ,,
1915 ..	388,105.93 ,,	1923 ..	2,952,609.86 ,,
1916 ..	1,878,496.83 profit		

Not only has the company lost money but it has incurred a big debt, which probably can never be paid back. Debts amounting to Y.50,000,000 are owed to Japanese financiers and another Tls. 2,500,000 to native banks, while, the present value of the properties is estimated at Tls. 22,030,000.

The Shantung Gold Mine

A placer deposit near Chefoo shows good prospects and the past record by working with dredges show favorable results. A study of the mine will be undertaken by the Commission and further help extended in order to develop it.

The Chai Tong Coal Mines, Hopei

These mines are located near Peiping and according to the old mining and drilling records, they yield, both coking, bituminous and anthracite coal over $3,500,000 were spent by the last operating company on a 30-kilometer railroad, connecting the mines with the Peiping-Hankow Railway, but an additional $8,000,000 will be required to put them into good working order. These mines will hold an important place in north China due to their proximity to Peiping, Tientsin and the Tangku seaports. It is also the only coking coal for the blast furnaces of the Lung Yen Iron mines.

China's Iron Industry

Dr. Karl Wendt, of Essen, introduces an article published in *Stahl und Eisen* with the remark that China is one of the oldest iron-producing countries ; her industry began many centuries before the Christian era. There still exist in that country many of the original small iron-smelting plants, as a rule situated where both coal and ore are available on the spot. The iron is used for making vessels for the temples, cart-tyres, ploughshares and many other objects in common use. These small smelters still produce some 180,000 tons of iron per annum, a rather remarkable tonnage, which until about 70 years ago was quite sufficient to cover China's whole consumption. It was not until the end of the eighties of last century that iron products began to be imported at the annual rate of some 6,000 to 7,000 tons ; rising to 70,000 tons by 1890, and now totalling 700,000 tons per annum.

Iron production by modern methods was only introduced about 40 years ago in China, when the well-known Viceroy, Chang Chi-tung, took it upon himself, in 1890, to establish a large iron and steel plant in the country itself, the original purpose of which was to supply the necessary equipment for the projected Hankow-Canton railway line, in which there is still an unbuilt gap of some 270 km. Later on the plant was to supply the country's other requirements and make China independent of imports. The site selected for the Viceroy's scheme was at the confluence of the rivers Han and Yangtze, opposite Hankow, in the industrial center of the country, and the works established there are the well-known Han-Yang Iron & Steel Works. For a long time these works were the only ones of their kind established in China.

TABLE I.—*Blast Furnaces in China.*

Place	*Owners*	*No. and size of furnace Tons*	*Annual output capacity Tons*
Han-Yang	Han Yeh Ping Co.	2 of 75 2 ,, 250	230,000
Ta-Yeh	Han Yeh Ping Co.	2 ,, 400	280,000
Hankow	Yangtse Engineering Works	1 ,, 100	36,000
Penchihu	Penchihu Co.	2 ,, 20 2 ,, 140	115,000
Anshan	South Manchuria Railway ..	2 ,, 250 1 ,, 500	360,000
Peking..	Lung-Yen Co.	1 ,, 250	90,000
Pootung	Wou-Ching Co.	1 ,, 12 1 ,, 33	16,000
		Total ..	1,127,000

The number and locations of the blast furnaces existing today in China are shown in Table I, with the names of the respective concerns owning them and their annual output capacities. All these plants are laid out on modern lines, but their output capacity, aggregating over 1¼ million tons, is only utilized at the rate of 25 to 30 per cent. If Japan for political considerations had not kept its two plants at Penchihu and Anshan going, notwithstanding their high working costs and the large interest charges on the invested capital, even the above low percentage of the total output capacity would not be reached, as there is not a single furnaec blowing in the whole country except those at the two above-named plants, under Japanese management.

Besides the blast furnaces, only a few open-hearth furnaces have been erected in the country, namely, seven of 30 tons each at Han-Yang and two of 15 tons each at Wou-Ching, but not one of these is now working. In some of the arsenals a couple of small open-hearth and electric furnaces are working for supplying the works' own requirements. No rolled iron and steel at all is produced in China.

Longest Tunnel in Orient Completed

The construction of the Shimizu Tunnel, the longest one in the Orient, on the railway going from Maebashi, Joshu, to Echigo, across the Shimizu Pass, was completed on March 14, the brick work, the last part, having been finished.

The gigantic project took 10 years for completion, entailing the cost of Y.12,000,000. The tunnel extends for 31,831 feet, or about six miles in length. Since the boring was completed at the end of 1929, the work of laying the bricks took 15 months.

All those who were engaged in the construction of the tunnel will celebrate the completion of the work on Sunday, March 15. The laying of the rails will be completed in a few months, and the traffic on the line will be started on September 1.

The difficult work claimed the lives of 49 men in 10 years, and a monument to the victims will be erected.

Tin Can Factory in Tientsin, China

Although there are a number of food canning, tea, and other factories in Tientsin which utilize tin containers, there is only one commercial tin can factory in the city. This factory supplies tea merchants, provision dealers, dyestuffs distributors, dispensaries, and other manufacturers, and dealers with containers. Food canners and various other users manufacture their own, usually by hand methods. The Min Hsin (Star) Can Factory was established in Tientsin in January, 1930.

Methods are not modern in comparison with those in the United States. The sheet tin, which is all imported, is stamped and cut to the required size by machine. The tins are rounded, bent or folded by other machines. No mechanical conveyor methods are used between different steps in the manufacture. After the cans are bent or folded to shape they are soldered by hand. Printing is done by machine after designs are engraved on a " printing stone " and transferred to rubber rolls.

The factory produces about 15,000 cans per month, which are sold by the factory direct to consumers.

List of Approved Contractors for S.M.R. Co.

On Monday, March 9, the Manchuria Civil Engineering and Building Association announced the names of the approved contractors, as appointed by the S. M. R. Co. for the new fiscal year.

The same list bears 88 names comprising 59 general contractors and 29 special contractors.

The new applicants to join the approved list were nine for general building works (only one accepted) ; five for heating installations (none accepted) ; three for electric works (none accepted); four for painting and varnishing (none accepted) ; mechanical engineering (Fukusho Co. alone accepted); two for well-sinking (neither accepted.)

The Obayashigumi, one of the most influential building contractors in Japan proper whose advent in the local building field created considerable fuss was not accepted.

The Fukusho Co., Imaigumi and three others have their spheres of operation enlarged on the merit of the splendid work done.

The contractors are divided into three groups : (1) railway, (2) civil engineering and building, and (3) special works, which last being subdivided into heating, reinforced concrete and machinery, machinery, electricity, painting, special concrete, and well-sinking.

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